THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LVII. No. 1445.] LONDON, JANUARY 20, 1891. [43RD YEAR. Price 6d.

WOLSTON'S Paste and Ready Mixed for Use.
Guaranteed Free from Adulteration. **TORBAY PAINTS.**
FOR GASHOLDERS, &c., &c.
The Original "Torbay Paints" As supplied during the present and many preceding years to the LONDON GASLIGHT & COKE COMPANY.
Special Quotations to Gas Companies.
TORBAY & DART PAINT Co., Ld.,
23, Gt. George St., Westminster, S.W.
Works: DARTMOUTH, DEVON.

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.
THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD, LONDON.
Ashmore, Benson, Pease, & Co., Ld.,
STOCKTON-ON-TEES,
Manufacturing Gas Engineers.
See Advertisement, p. 130

CEMENT
EARLE'S
BEST
Portland Cement
MANUFACTURED BY
GEO. & THOS. EARLE,
HULL.
Office: 7, PIER STREET.
Works: WILMINGTON.
STOREAGE CAPACITY 10,000 Tons.
ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.
Telegraphic Address: "CEMENT HULL."

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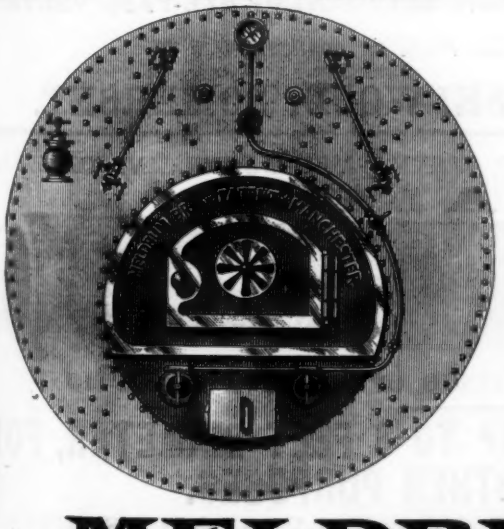
"ABYSSINIAN" & ARTESIAN TUBE WELLS,
FOR TOWN WATER-WORKS AND OTHER SUPPLIES.
The following Town Water-Works Supplies have been obtained by this System, viz. :—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford, Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.
LE GRAND & SUTCLIFF,
HYDRAULIC ENGINEERS, 100, BUNHILL ROW, LONDON, E.C.

SELF-CONTAINED DUST FUEL FURNACE.



OVER 200 WORKING,
RAISING STEAM WITH COKE DUST, COAL DUST, TOWNS' REFUSE, AND OTHER WASTE FUEL.
GLASGOW: F. J. ROWAN, 121, West Regent Street
LONDON: WM. BOBY, 16, Union Court, Old Broad Street.
GERMANY, AUSTRIA, BELGIUM, SWITZERLAND, ITALY } ALFRED WENNER, Manchester.
MELDRUM BROS.,
26, HALF STREET, MANCHESTER.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM

(ESTABLISHED 1765).

MANUFACTURER OF TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES SUPPLIED ON APPLICATION.

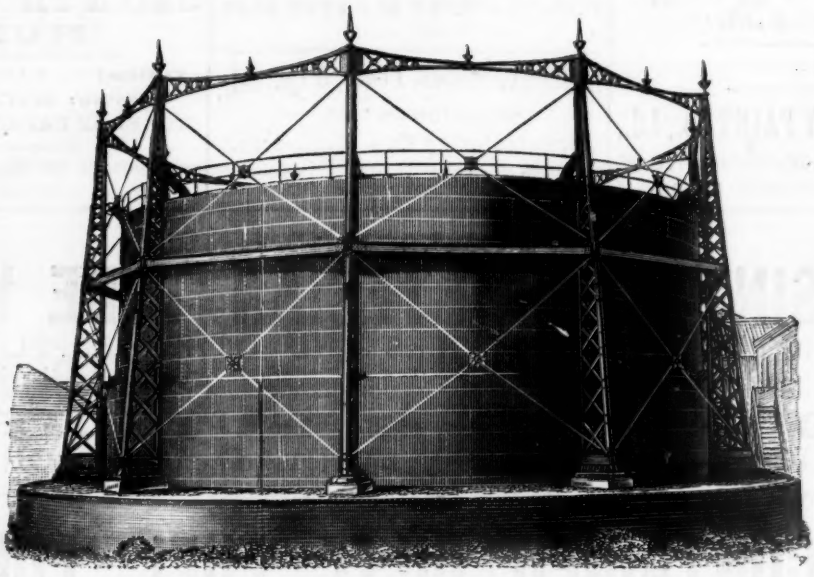
TELEGRAPHIC ADDRESS: "COCKEY'S FROME."

EDWARD COCKEY & SONS, Ld.,

ESTABLISHED OVER HALF A CENTURY.

Gas Engineers, Ironfounders, & Contractors,

Manufacturers of *GASHOLDERS and TANKS, BOILERS and ENGINES, ROOFS, EXHAUSTERS, BREEZE SCREENS, CHARGING and COKE BARROWS.*



Manufacturers of *PATENT WASHERS, PATENT VALVES for PURIFIERS, &c., GOVERNORS, LAMP COLUMNS, Weighbridges, COKE BREAKERS.*

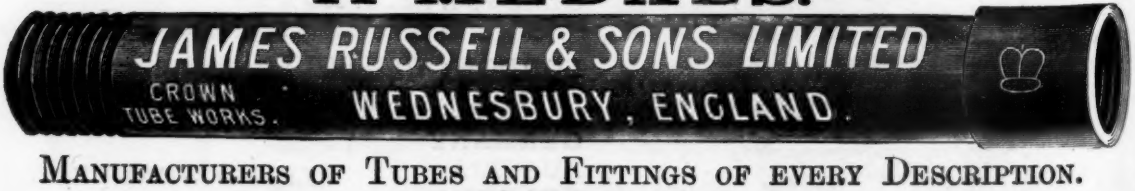
SOLE MAKERS OF COCKEY AND SMITH'S PATENT SELF-ACTING BYE-PASS VALVES.

Estimates for any description of Gas Plant on application.

THE IRON-WORKS, FROME SELWOOD, SOMERSET.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

—11 MEDALS.—



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WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

LONDON: 108, Southwark Street,

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THOMAS PIGGOTT & CO.,

Established 1822

— SPRING HILL, BIRMINGHAM, —

MANUFACTURERS OF

GAS APPARATUS

Of every description.

GASHOLDERS
AND TANKS.

RETORTS, PURIFIERS,
VALVES, SCRUBBERS,
CONDENSERS, ETC., ETC

All of the most approved designs.

BOILERS, ENGINES,
PUMPS.

Beale's and other Exhausters.

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LONDON OFFICE:
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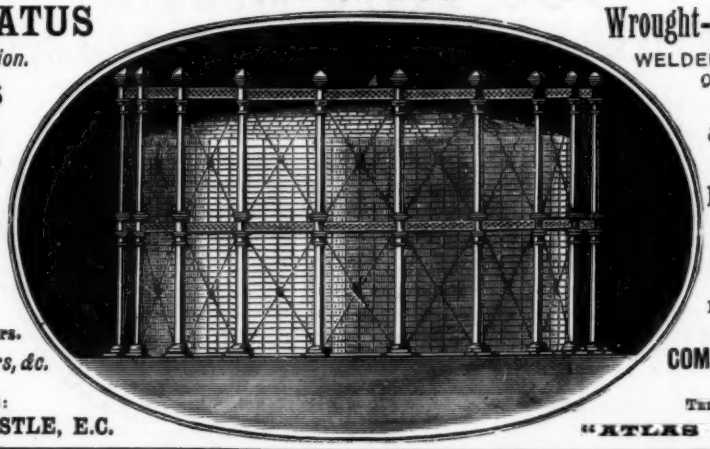

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WELDED AND RIVETTED PIPES
OF ALL KINDS OVER
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SOMERVILLE'S PATENT

RETORT MOUTHPIECES
AND
SELF-SEALING LIDS.

No luting required.

Drawings, Specifications, and Estimates prepared for

COMPLETE GAS PLANTS

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GAS TUBES

MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

NEWTON, CHAMBERS, & CO., LIMITED

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

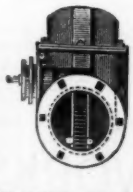
SLIDE VALVES,
WITH RACK & PINION,
OR
Internal or External
SCREWS, of all Sizes.

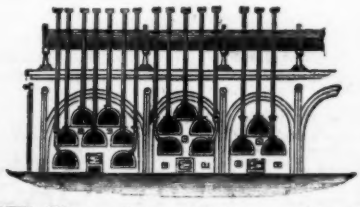
GASHOLDERS,
AND
Gasholder Tanks.

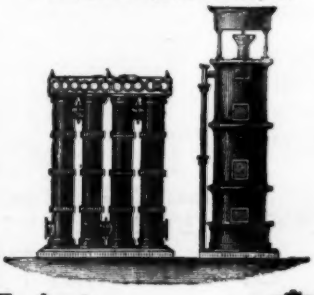
CAST-IRON RETORTS,
RETORT-BED FITTINGS,
And Retort-House Appliances
of every description.
Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

WROUGHT AND CAST IRON
CONDENSERS,
SCRUBBERS, & WASHERS,
TAR AND LIQUOR PUMPS, &c.

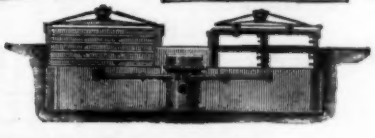
PATENT
CENTRE VALVES
for working Purifiers.
Also Bye-Pass & Stop Valves.







PURIFIERS with Planed Joints,
HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS,
WOOD GRIDS.
CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

CROSSLEY'S "OTTO" GAS-ENGINE.

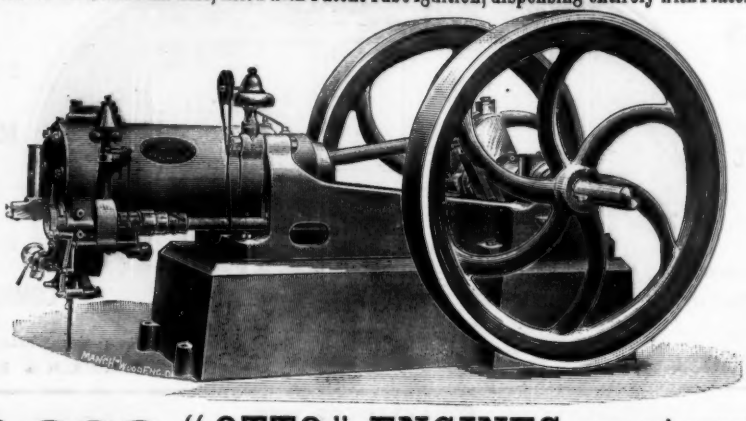
100 Prize Medals.

MADE in SIZES
2-Man to 100-HP.

GAS-ENGINES
COMBINED
WITH
PUMPS
FOR
TOWNS SUPPLY,
SEWAGE, &c., &c.

GAS-ENGINES
COMBINED
WITH
AIR COMPRESSORS
FOR THE
SHONE SEWAGE
SYSTEM, LUCIGEN
LIGHT, &c.

New 14-H.P. Nominal Size, fitted with Patent Tube Ignition, dispensing entirely with Plates.



MADE in SIZES
2-Man to 100-HP.

VERTICAL
AND
HORIZONTAL
TYPES.

ENGINES
COMBINED
WITH
HOISTS, PUMPS,
DYNAMOS &c. &c.

Largely used for
EXHAUSTING,
PUMPING,
COKE CRUSHING,
ELECTRIC LIGHTING,
&c., &c.

Over **31,000** "OTTO" ENGINES are at work.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER,

LONDON,
LIVERPOOL,
GLASGOW,
NEWCASTLE,
BIRMINGHAM,
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HARRIS & PEARSON,

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MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

SAML. CUTLER & SONS, ENGINEERS.

ALL GASHOLDERS

Should be fitted with

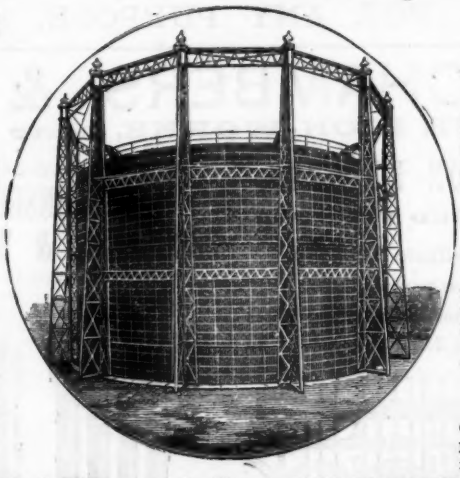
CUTLER'S PATENT
FREEZING PREVENTER

Which has been

APPLIED MOST SUCCESSFULLY

At

LONDON GASLIGHT AND COKE COMPANY; IMPERIAL CONTINENTAL GAS ASSOCIATION; BROMLEY (KENT); YARMOUTH; HERTFORD; KING'S LYNN, &c., &c.



TESTIMONIALS.

Mr. WILLIS, of the Great Yarmouth Gas-Works, writes:

"We had a very sharp frost last night, which gave us a fair opportunity of testing the steam arrangement to Gasholder. You will be pleased to hear it was very effective; in fact, doing all we require."

Mr. Dow, King's Lynn, writes on Jan. 7, 1891:

"The apparatus you fixed to our Gasholder for preventing the water freezing in the cups has had a very good test the last few weeks' severe weather; and it gives me much pleasure to inform you that we have not had the least trouble with ice, and that it is a perfect success."

C. WOODALL, Esq., Palace Chambers, Westminster, writes on Jan. 10, 1891:

"I have fitted to several Gasholders your special apparatus for conveying steam to the cups, and preventing freezing; and it has proved satisfactory."

NEWBIGGING'S "HANDBOOK FOR GAS MANAGERS" (1889 edition, page 193) says:

'Messrs. S. Cutler & Sons have devised an apparatus for preventing freezing of the water in Gasholder Cups. The arrangement is self-acting, compact, and trustworthy.'

CUTLER'S SPECIALITIES FOR GAS-WORKS:

MORRIS & CUTLER'S PATENT CONDENSER—The best obtainable.
LIVESEY & TANNER'S TAR AND LIQUOR OVERFLOWS.
CUTLER'S PATENT WATER-VALVES FOR PURIFIERS, &c.
EVERY REQUIREMENT FOR GAS-WORKS AND WATER-WORKS.

Offices: 16, GREAT GEORGE STREET, WESTMINSTER, S.W.
Works: PROVIDENCE IRON-WORKS, MILLWALL, LONDON.
TELEGRAMS: "RETORTUS LONDON."

JOSEPH CLIFF & SONS,

INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,
WORTLEY, LEEDS.

LONDON Offices & Depôts:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
16, Lightbody Street.
LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

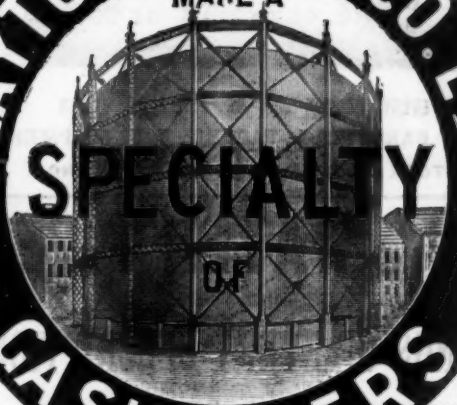
ESTABLISHED MORE THAN A QUARTER OF A CENTURY

WORKS HUNSLET, LEEDS

LONDON OFFICE: 60, QUEEN VICTORIA STREET E.C.

CLAYTON SON & CO. LTD.

MAKE A SPECIALTY OF GASHOLDERS



AND MAKERS OF GAS PLANT OF EVERY DESCRIPTION.

REG? TELEGRAPHIC ADDRESS: "GAS LEEDS"

THE WIGAN COAL & IRON CO., LIMTD.,

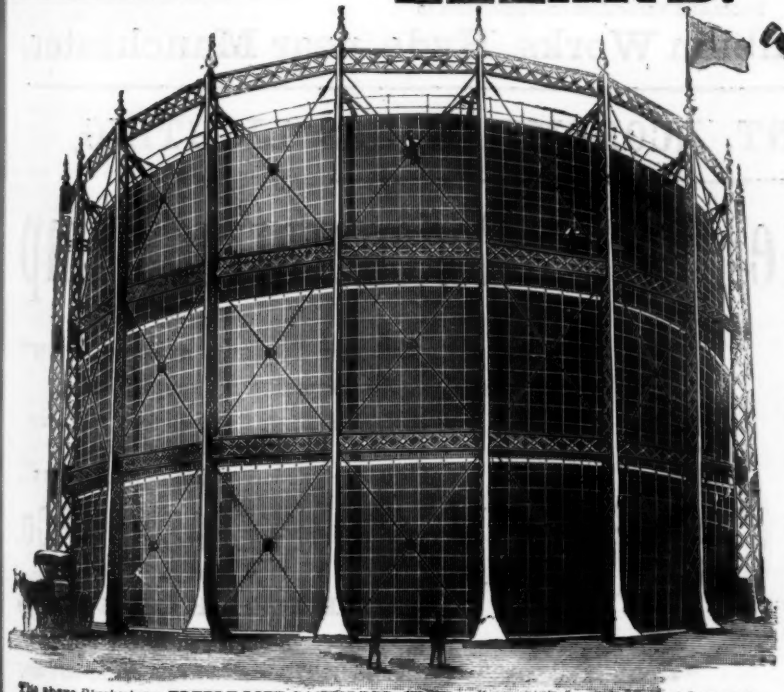
Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

MIDLAND DISTRICT OFFICE: 22, TEMPLE ST., BIRMINGHAM—SOLE AGENT: A. C. SCRIVENER.
TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.
LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, SOLE AGENTS.
TELEGRAPHIC ADDRESS: "PARKER LONDON."

R. DEMPSTER & SONS, Ltd.,

ROSE MOUNT GAS ENGINEERING WORKS,

ESTABLISHED — ELLAND. — 1855.



The above illustrates a TREBLE-LIFT GASHOLDER, 171, 191, and 188 feet diameter by 35 feet deep each, as made for the MELBOURNE GAS COMPANY.

GAS AND CHEMICAL PLANT OF EVERY DESCRIPTION — ALL SUNDRIES SUPPLIED.

OUR
ROTARY EXHAUSTERS
Are acknowledged to excel in efficiency and finish.

OUR IMPROVED
COKE-BREAKING MACHINE
Is a pronounced success.

Designs, Specifications, and Estimates submitted on application to

R. Dempster & Sons, Ltd.,
ELLAND.

JOHN HALL & CO.,

STOURBRIDGE,

MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.
RETORTS CAREFULLY PACKED FOR SHIPMENT.
A STOCK OF DIFFERENT SHAPES ON HAND.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

CHESTERFIELD.

TRADE	TELEGRAMS:	LONDON AGENTS:
O X O	"JACKSON"	BECK & Co.,
MARK.	CLAY CROSS.	130, GT. SUFFOLK ST., S.E.

SULPHATE OF AMMONIA.

By Her Majesty's Royal Letters Patent.

DR. FELDMANN'S APPARATUS

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES, APPLY TO THE

Sole Agents and Manufacturers,

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT, BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (4 Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations—

ILKESTON.	BURY.	CHORLEY.
WIDNES	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT.

RUSCOE'S PATENT MACHINE

FOR DRILLING AND TAPPING WATER-MAINS AND GAS-MAINS UNDER PRESSURE.

Patent Saddle Back and Drilling Apparatus, whereby Gas and Water Mains can have 2-in., 3-in., 4-in., 5-in., and 6-in. Branches put on without loss of Water or Gas.

Sole Maker of HELPS' PATENT PIPE EXTRACTOR.

Prices and Particulars on Application to

JOHN RUSCOE, Albion Works, Hyde, near Manchester.

SIXTY PER CENT. ECONOMY IN GAS LIGHTING.

The Schülke Regenerative Lamp

FOR

DOMESTIC AND EXTERNAL LIGHTING.

The only Regenerative Lamp employing the Common Flat-Flame Burners.

Lamps giving 20-Candle power consume less than four feet of Gas per hour.

PURE WHITE & PERFECTLY STEADY LIGHT,

NOT AFFECTED BY DRAUGHTS.

Suitable for any existing fittings (Brackets or Suspending).

Can be fixed in a few minutes.

May be seen at the Offices of the

SCHÜLKE GAS-LAMP Co.

LIMITED,

20, HIGH HOLBORN,

LONDON, W.C.,

Where Price Lists and full particulars may be obtained.

KIRKHAM, HULETT, & CHANDLER'S, LTD.

[SIDNEY HERSEY, Managing Director.] **NEW PATENT** [J. CHANDLER, Engineer.]

"STANDARD" WASHER

EXTRACTS the WHOLE of the AMMONIA

Also a Large Proportion of H_2S and CO_2 from Gas.

Has been in operation over two years at the Beckton Station of The Gaslight and Coke Company. (See below.)

TESTIMONIAL FROM THE CHIEF ENGINEER OF THE GASLIGHT AND COKE COMPANY.

The Gaslight and Coke Company, Horseferry Road, Westminster, S.W.,
Nov. 25, 1889.

Messrs. KIRKHAM, HULETT, AND CHANDLER, LIMITED,

GENTLEMEN,—In reply to your enquiry respecting the result of putting "Wooden Bundles" into some of the Washer-Scrubbers at our Beckton Station, I beg to say they have answered admirably for the few months they have been in; and I think them a decided success.—I am, yours truly,

(Signed) G. C. TREWBY.

Order just received from the BIRMINGHAM Corporation for new patent "Bundles" for RENEWAL THROUGHOUT the 5,000,000 cubic feet per day "Standard" Washer erected in 1882.

For List of "Standard" Washer-Scrubbers supplied of above-mentioned pattern and renewals effected by application of same to old pattern machines, see last and next weeks' issue of the JOURNAL.

PALACE CHAMBERS, BRIDGE STREET,

WESTMINSTER, S.W.

R. & J. DEMPSTER,

GAS PLANT WORKS, NEWTON HEATH, MANCHESTER,

MAKERS AND ERECTORS OF

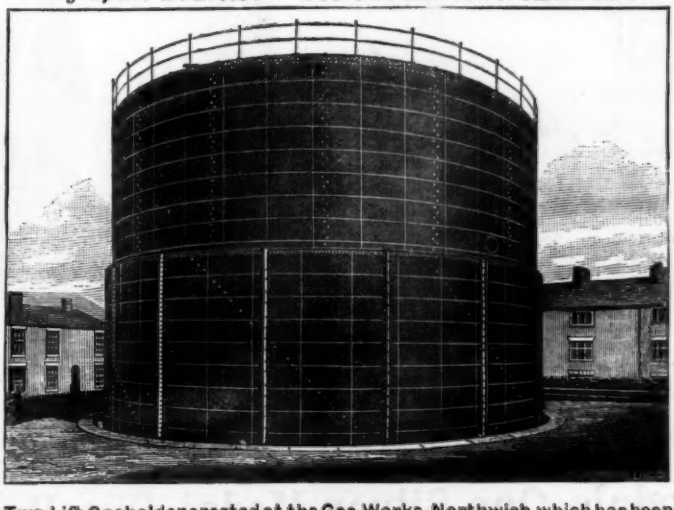
PATENT COLUMNLESS GASHOLDERS.

Telegraphic Address: "SCRUBBER MANCHESTER."

TOTAL WEIGHT REDUCED from 30 per cent. to 50 per cent.

TRANSPORT AND ERECTION REDUCED to the same extent; and in cases where gasholders are shipped abroad to places difficult of access, this represents a very large amount of money.

TANK CONSTRUCTION SIMPLIFIED. The Tank wall (of whatever construction) is a regular cylinder. There are no piers needed, and all expensive foundation stones for the base of columns or standards are dispensed with.



Two-Lift Gasholder erected at the Gas-Works, Northwich, which has been in continuous work since Jan. 3, 1890, and has been subjected to most severe tests from heavy gales, with perfectly satisfactory results.

COST OF PAINTING SAVED for the Columns and Girders.

TILTING UTTERLY IMPOSSIBLE; And as there are fewer parts, there is less liability for the Gasholder to get out of order in working.

STABILITY UNDER WIND PRESSURE of a Gasholder constructed upon this system is at least equal to, and from experiments and calculations made is far in excess of, that of a Holder of the same dimensions guided by the elaborate guide framing at present in use.

The removal of heavy guide carriages and rollers from the top curbs considerably lowers the centre of gravity of the structure, and dispenses with the extra strength of sheeting necessary to carry these at the points where they are attached to the gasholder.

The plan adapts itself to telescoping to any reasonable extent, and enables very shallow holders or lifts to be employed with perfect stability.

FOR FURTHER PARTICULARS AND ESTIMATES, APPLY TO THE ABOVE.

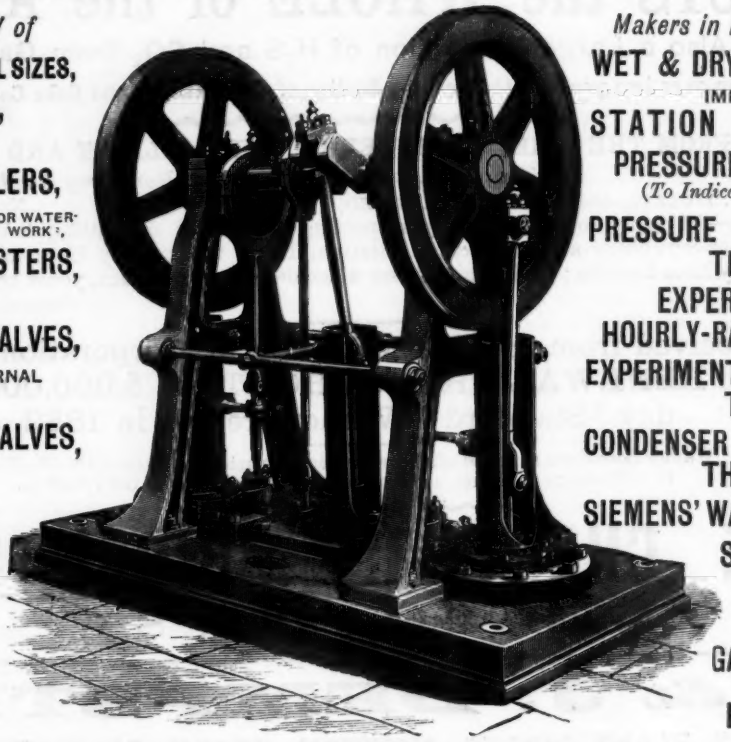
R. LAIDLAW & SON,

GAS AND WATER ENGINEERS.

Manufacturers of **GAS APPARATUS** of every Description.

Makers in GLASGOW of

CAST-IRON PIPES, ALL SIZES,
LAMP PILLARS,
STEAM-ENGINES AND BOILERS,
PUMPING ENGINES FOR WATER-WORKS,
BEALE'S GAS EXHAUSTERS,
DOUBLE-FACED SLUICE VALVES,
INTERNAL AND EXTERNAL RACK OR SCREW SLIDE VALVES,
CAST-IRON COLUMNS,
BEAMS, GIRDERS, AND WATER-TANKS,
WROUGHT-IRON TUBES,
FITTINGS, &c.



Makers in EDINBURGH of

WET & DRY GAS-METERS,
IMPROVED STATION GOVERNORS,
PRESSURE REGISTERS *(To Indicate New Time)*,
PRESSURE GAUGES,
TEST HOLDERS,
EXPERIMENTAL HOURLY-RATE METERS,
EXPERIMENTAL TEST METERS,
CONDENSER THERMOMETERS,
SIEMENS' WATER-METERS,
STREET LANTERNS,
And all Kinds of
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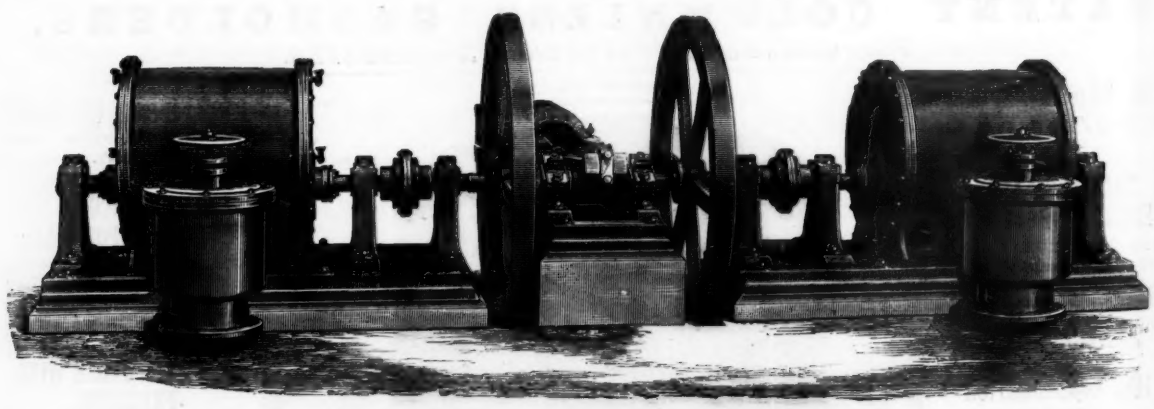

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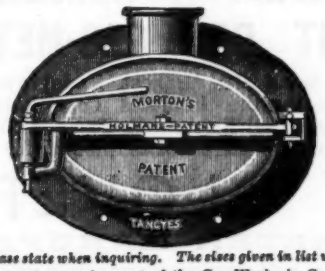
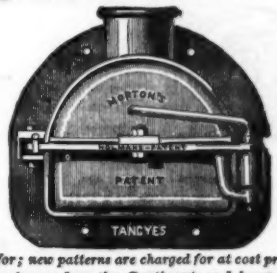
Sole Makers of **MORTON'S** Patent Self-Sealing **RETORT-LIDS,**

With Anti-Friction CATCHES, and Self-Sustaining CROSS-BARS.





Price of Mouthpieces depends on number required, which please state when inquiring. The sizes given in list we have patterns for; new patterns are charged for at cost price.

These Patent Retort Lids and Fastenings are in extensive use in most of the Gas-Works in Great Britain, America, and on the Continent, and have almost entirely displaced the older method of sealing by a luting of lime or other material. The Lids are made in three forms, D, oval, and round (as shown above), in each of which we have a very extensive variety of patterns, from which Gas Engineers contemplating the adoption of these lids are recommended to make their selection, in order to avoid cost of pattern making, delays, &c., &c.

Mouthpieces with Circular Lids for Oval Retorts.

Pattern No.	Diam. Mouth.	Internal Dimensions of Retort.	Length of Mouthpiece.	PRICE, Lid and Fittings without Mouthpiece.
13658	14 ins.	14 × 12 ins.	15 ins.	£0 19 0
4356	14 ,,	18½ ,, 12 ,,	19½ ,,	0 19 0
6851	15 ,,	16 ,, 14 ,,	13 ,,	1 0 0
3629	15 ,,	18¼ ,, 13½ ,,	14 ,,	1 0 0
3580	15 ,,	21 ,, 15 ,,	15 ,,	1 0 0
6264	16 ,,	18½ ,, 15½ ,,	15¾ ,,	1 1 0
5210	16 ,,	20 ,, 14 ,,	15 ,,	1 1 0
6263	16 ,,	24 ,, 16 ,,	13½ ,,	1 1 0
5370	17 ,,	20 ,, 14 ,,	14 ,,	1 3 0
6832	17 ,,	20 ,, 14 ,,	17 ,,	1 3 0
6183	17 ,,	20 ,, 15 ,,	15 ,,	1 3 0
4289	17 ,,	21 ,, 15 ,,	14 ,,	1 3 0
5270	17 ,,	22 ,, 14 ,,	14 ,,	1 3 0
3631	18 ,,	18 ,, 14 ,,	20 ,,	1 5 0
3681	18 ,,	21 ,, 14 ,,	13½ or 15 ,,	1 5 0
3554	18 ,,	21 ,, 15 ,,	14¾ ,,	1 5 0
7957	18 ,,	22 ,, 16 ,,	14 ,,	1 5 0
8048*	19 ,,	25½ ,, 15 ,,	18 ,,	1 8 6

Mouthpieces with Oval Lids for Oval Retorts.

Pattern No.	Dimensions of Mouth.	Internal Dimensions of Retort.	Length of Mouthpiece.	PRICE, Lid and Fittings without Mouthpiece.
9800	18 × 14⅞ ins.	18 × 14½ ins.	15 ins.	£1 5 0
9205	20 ,, 12 ,,	24 ,, 14 ,,	10½ ,,	1 10 0
10000	20½ ,, 14½ ,,	20½ ,, 14½ ,,	15 ,,	1 10 0
9680	21 ,, 15 ,,	21 ,, 15 ,,	15 ,,	1 12 0
10056	21 ,, 14½ ,,	21 ,, 14½ ,,	15½ ,,	1 12 0
13218	21 ,, 15 ,,	21 ,, 15 ,,	17 ,,	1 12 0
10514	22½ ,, 13⅞ ,,	22½ ,, 13⅞ ,,	13⅞ ,,	1 13 0
13766	20 ,, 17 ,,	20 ,, 17 ,,	15½ ,,	1 15 0
13269	24 ,, 15 ,,	24 ,, 15 ,,	16 ,,	1 18 0

190

Mouthpieces for Round Retorts.

Diam. .. .. ins.	14	15	16	17	18
Price, Lid and Fittings without Mouthpiece £	0 19 0	1 0 0	1 1 0	1 3 0	1 5 0

Mouthpieces with Circular Lids for D Retorts.

Pattern No.	Diam. Mouth.	Internal Dimensions of Retort.	Length of Mouthpiece.	PRICE, Lid and Fittings without Mouthpiece.
5348	14 ins.	14 × 13 ins.	7 ins.	£0 19 0
3463	15 ,,	15 ,, 13 ,,	14 ,,	1 0 0
6678	15 ,,	15 ,, 14 ,,	12 ,,	1 0 0
3661	15¼ ,,	15½ ,, 13 ,,	12 ,,	1 1 0
13052	16 ,,	16 ,, 13 ,,	18 ,,	1 1 0
5601	16 ,,	16 ,, 14 ,,	15 ,,	1 1 0
6827	16 ,,	16 ,, 14 ,,	17 ,,	1 1 0
4494	16 ,,	16 ,, 14 ,,	14 ,,	1 1 0
3548	16 ,,	16 ,, 15 ,,	13½ ,,	1 1 0
6677	16 ,,	16½ ,, 13½ ,,	12½ ,,	1 1 0
9645	16 ,,	16½ ,, 13⅞ ,,	12½ ,,	1 1 0
4434	16 ,,	17½ ,, 14 ,,	14 ,,	1 1 0
6469	16 ,,	18 ,, 14 ,,	15 ,,	1 1 0
9015	16 ,,	18 ,, 14 ,,	18½ ,,	1 1 0
4327	16 ,,	18 ,, 15 ,,	15½ ,,	1 1 0
8049*	16 ,,	18 ,, 15 ,,	17⅞ ,,	1 1 0
6137	16 ,,	20½ ,, 13½ ,,	18½ ,,	1 1 0
5918	17 ,,	18 ,, 14 ,,	14 or 17 ,,	1 3 0
5053	17 ,,	19⅜ ,, 12 ,,	14½ ,,	1 3 0
7548	17 ,,	20 ,, 13 ,,	15 ,,	1 3 0
6468	17 ,,	20 ,, 16 ,,	15½ ,,	1 3 0
4316B	17 ,,	21 ,, 14 ,,	14 ,,	1 3 0
7975	17 ,,	21 ,, 15 ,,	14½ ,,	1 3 0
13459	17 ,,	21½ ,, 13½ ,,	15 ,,	1 3 0
12990	18 ,,	18 ,, 15 ,,	15 or 19 ,,	1 5 0
7135	18 ,,	18½ ,, 15 ,,	18 ,,	1 5 0
10221	18 ,,	18 ,, 16 ,,	12⅜ ,,	1 5 0
4506	18 ,,	20 ,, 13 ,,	19½ ,,	1 5 0
6479	18 ,,	20 ,, 13 ,,	15 ,,	1 5 0
6818	18 ,,	20 ,, 13¾ ,,	17⅛ ,,	1 5 0
4083	18 ,,	20 ,, 15 ,,	16 ,,	1 5 0
5306	18 ,,	20½ ,, 14 ,,	13½ ,,	1 5 0
13295	18 ,,	20½ ,, 14 ,,	19½ ,,	1 5 0
7356	18 ,,	20½ ,, 13½ ,,	18 ,,	1 5 0
4569	18 ,,	21 ,, 14 ,,	18 ,,	1 5 0
3628	18 ,,	21 ,, 15 ,,	16 ,,	1 5 0
7640	18 ,,	22 ,, 12½ ,,	13½ ,,	1 5 0
7971*	20 ,,	20 ,, 16 ,,	18 ,,	1 11 0

*Patterns marked * have Sockets at back to connect to Retorts; all the others are flanged. Patterns marked B have curved bottoms.* 191

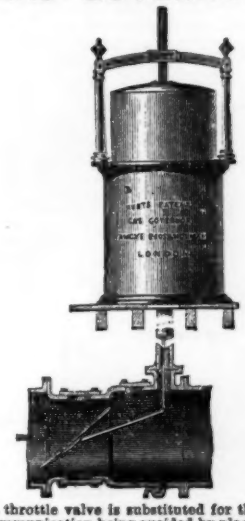
Mouthpieces with D Lids for D Retorts.

Pattern No.	Dimensions of Mouth.	Internal Dimension of Retort.	Length of Mouthpiece.	PRICE, Lid and Fittings without Mouthpiece.
12292	15½ × 13 ins.	15½ × 13 ins.	12 ins.	£1 2 0
9967	16 ,, 14 ,,	16 ,, 14 ,,	15½ ,,	1 3 6
13574	16¾ ,, 13⅞ ,,	16¾ ,, 13⅞ ,,	12½ ,,	1 4 0
9899	18 ,, 12 ,,	18 ,, 12 ,,	14 ,,	1 4 0
12980	16 ,, 16 ,,	16 ,, 16 ,,	18 ,,	1 6 0
13900	18 ,, 13⅞ ,,	18 ,, 13 ,,	15 ,,	1 6 0
9912	18 ,, 13½ ,,	18 ,, 13½ ,,	17 ,,	1 6 0
9962	18 ,, 13½ ,,	18 ,, 13½ ,,	16 ,,	1 6 0
10982	18 ,, 13⅝ ,,	18 ,, 14 ,,	15 ,,	1 6 0
11098	18 ,, 14 ,,	18 ,, 14 ,,	12 ,,	1 6 0
9492	20 ,, 13 ,,	20 ,, 13 ,,	15 ,,	1 10 0
9208	20 ,, 13 ,,	20 ,, 13 ,,	19½ ,,	1 10 0
10251	20 ,, 13 ,,	20 ,, 13 ,,	15½ ,,	1 10 0
12964	20 ,, 13 ,,	20 ,, 13 ,,	18½ ,,	1 10 0
9909	20 ,, 13⅝ ,,	20 ,, 13⅝ ,,	17 ,,	1 10 0
12969	19½ ,, 15½ ,,	19½ ,, 15½ ,,	14 ,,	1 11 0
13781	20 ,, 15 ,, Front. / 21 ,, 15 ,, Back.	21 ,, 15 ,,	15 ,,	1 11 0
7692	21 ,, 15½ ,,	21 ,, 15½ ,,	16 ,,	1 11 0
12978	20 ,, 16 ,,	20 ,, 16 ,,	17 ,,	1 11 0
13252	20 ,, 16 ,,	20 ,, 16 ,,	18 ,,	1 11 0
13220	21 ,, 15 ,,	21 ,, 15 ,,	17 ,,	1 11 0
8977	21½ ,, 13⅝ ,,	21½ ,, 13⅝ ,,	18⅝ ,,	1 11 0
8976	21½ ,, 13⅝ ,,	21½ ,, 13⅝ ,,	18⅝ ,,	1 12 0
10497	21½ ,, 13⅝ ,,	21 ,, 13½ ,,	18⅝ ,,	1 12 0
8037	21½ ,, 13⅝ ,,	21½ ,, 13⅝ ,,	18⅝ ,,	1 12 0
9908	21½ ,, 13⅝ ,,	21½ ,, 13⅝ ,,	15 ,,	1 12 0
10404	21½ ,, 13⅝ ,,	22 ,, 14 ,,	18⅝ ,,	1 12 0
12410	21½ ,, 13⅝ ,,	22 ,, 14 ,,	12 ,,	1 12 0
13822	21½ ,, 13⅝ ,,	22 ,, 14 ,,	15 ,,	1 12 0
10515	22½ ,, 13⅝ ,,	22½ ,, 13⅝ ,,	13½ ,,	1 12 0
7924	24 ,, 14 ,,	24 ,, 14 ,,	15 ,,	1 13 0
13807	24 ,, 15½ ,,	24 ,, 15½ ,,	18 ,,	1 14 0
9015B	25 ,, 14 ,,	25 ,, 14 ,,	12½ ,,	1 14 0
10932	25 ,, 14 ,,	24 ,, 14 ,,	13½ ,,	1 15 0
12944B	22 ,, 16 ,,	22 ,, 16 ,,	16 ,,	1 15 0

Patterns marked B have curved bottoms. 192

HUNT'S PATENT EQUILIBRIUM DIRECT MAIN

GAS GOVERNOR.



In this Governor a throttle valve is substituted for the ordinary suspended cone; all external communication being avoided by placing the lever or radius arm inside the valve chamber upon the disc.

The disc is carried upon steel centres, upon which it is accurately balanced.

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5 ,, ..	20 0	10 ,, ..	33 0	16 ,, ..	46 0	24 ,, ..	72 0
6 ,, ..	22 10	12 ,, ..	38 0	18 ,, ..	50 0	36 ,, ..	130 0

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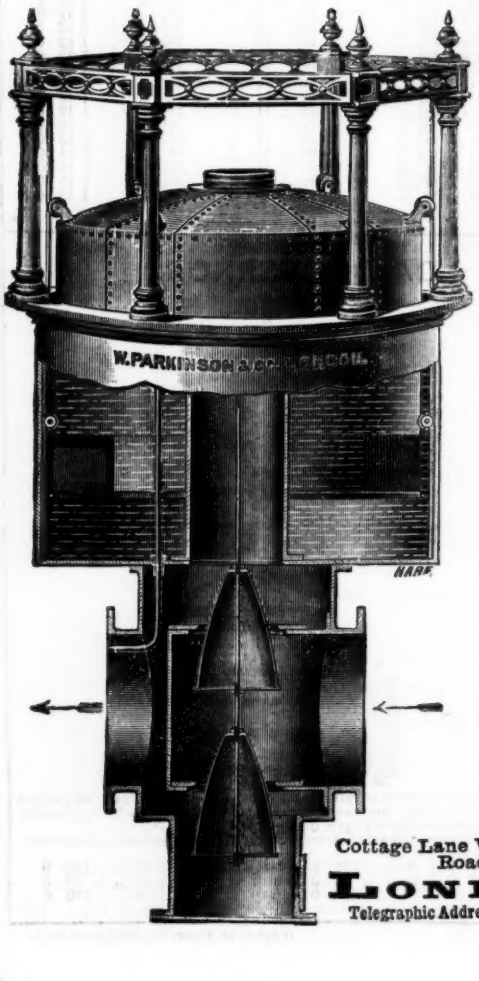

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 20, 1891.

Gas Legislation for 1891.

THE season has arrived for the publication of the Private Bills which are to be submitted to Parliament during the session that will re-open next Thursday; and, accordingly, there will be found in another column our usual summary of the contents of the Bills relating to gas supply. This annual statement, which is one of the traditional features of the JOURNAL, constitutes, together with the abstract of the Acts, which comes after the close of the session, a most important progressive record of legislative regulation of the British gas industry. Since it often happens, however, that what is customary and familiar is overlooked, it may be well to explain, in a few words, the character and scope of these parliamentary and statutory abstracts. They do not form light or entertaining reading to anybody who is not specially interested in the Bills or Acts treated of. Both Bills and Acts are terribly dull matter in the ordinary way; but, like some other unattractive subjects, they cannot be quite ignored. Ignorance of the law excuseth no man; and a British gas engineer who does not keep up his parliamentary and law reading by the means which we place at his disposal, must be content to be classed beneath those of his contemporaries who do take this trouble, which, after all, is no great tax. Comprehensive and reliable knowledge in these matters ranks an engineer at once among those who have a mind above mere routine.

Beginning, of course, with his "Michael and Will," the student of parliamentary engineering progresses to the consideration of the Special Acts relating to his own undertaking; comparing these with other Special and Local Acts to which he can obtain access, and reading them all by the light of Stevenson's "Precedents." After this he may proceed intelligently to the examination of the JOURNAL abstracts, which are moulded on the model of the latter work. That is to say, we give all Bills in regular sequence by name—first stating their principal object, and immediately afterwards recording the proposed arrangements with regard to capital, dividend, sliding scale or maximum selling price, and quality of gas, whenever these matters are included in the measure. If the Bill contemplates an extension of the lighting district or an addition to the gas lands, the fact is stated. Then we always give in more or less detail, according to their novelty and importance, any special provisions which may be found in the Bill. When the Bills have been converted into Acts, the same ground is gone over again in the case of all projects that have become statutes; the summary being thus fitted for consultation as an appendix for the year to "Stevenson," only with rather more detail. Wherever it would be instructive, moreover, we usually point out the difference between the Act and the Bill of which it is the final shape, although this can, of course, be readily done by referring to the proper number of the JOURNAL. In this way is provided an easy study of what is desired and actually accomplished in gas legislation from year to year; showing what Gas Companies and Corporations wish to obtain on their own motion, and what Parliament in its wisdom, or at any rate in its might, may think fit for them. Nobody can possibly know, without reading these records, how gas legislation tends to change in character from one year to another; for it assuredly does change, and very seriously too, although, like a great many other irresistible secular movements, the rate may be almost imperceptibly slow for any short interval of time. There is, of course, a great sameness in parliamentary proceedings; but when one follows them regularly and systematically, what is most striking is not the uniformity, but the differences in this class of business. Where many gas engineers, directors, and secretaries of gas companies and corporation departments err is in only looking into this matter when they are themselves actually "in Parliament," as the phrase goes. It would cost them but little time and trouble, as already pointed out, to keep their parliamentary information up to date by the aid of the JOURNAL; and then they would not flounder so lamentably as they sometimes do when their own trial comes. If these gentlemen, who any year may find themselves in the position of promoters or opponents of a Private Bill, would post themselves regularly as to what Parliamentary Committees are or are not likely to do for the time being, they might save themselves much anxiety, their undertakings some expense, and their professional advisers no inconsiderable trouble.

Certain novel points in prospective gas legislation are raised in several of this year's Bills. For some time it has been apparent that, in the case of old-established and prosperous Gas Companies, the Committees have favoured an increase of borrowing powers to the extent of one-third of the paid-up share capital instead of the customary one-fourth. Those who drafted the Kettering Bill have taken note of this movement, and also want all their capital to carry a nominal 10 per cent. dividend. On the other hand, the Bristol Company appear to dislike the sound of high dividends; and they accordingly desire to change their 10 per cent. into 5 per cent. capital. The

discussions on these proposals should raise the whole question of limitation of dividends on gas stock to a stated figure. In the days of maximum dividends, it was reasonable that if original shareholders who had run all the risk were entitled to 10 per cent. dividends, new capital should not carry so much benefit. Hence we had the limitation of dividends on the additional capital of an established Gas Company to 7 per cent. or less. The auction clauses and sliding scale removed the reason for this restriction; because when a man buys gas stock in the open market, he pays for it according to its value as an investment, and it makes no difference to him or to the concern which receives his premiums whether his purchase is rated as 10, 7, or 5 per cent. stock. It is altogether different if these various stocks have been allotted to shareholders privately, and without premiums, in the old style. Then a sliding scale of selling price and dividend which links one-quarter per cent. with a penny up or down, if correctly adjusted for a nominal 10 per cent. stock should give only one-eighth per cent. for a penny for 5 per cent. stock, and so on for any other class of stock. The perpetuation of the idea of making Gas Companies' new capital bear a nominal 7 per cent. dividend, subject to auction clauses and sliding scale, is therefore a survival from a condition and age of gas finance no longer existing. On the whole, however, since the more premium capital a gas undertaking can obtain the better, it will generally be found preferable to raise all gas capital to the 10 per cent. class than to reduce it as the Bristol Company propose doing.

Another novelty in the Kettering Bill is the proposal to establish, out of the divisible profits above 10 per cent., a pension fund for officials. This project raises a question which is less for Parliament than for gas administrators to settle in council. The best way to provide for the retirement of gas-works officials is a fit subject for discussion by those interested in the industry. There is no economy, but very much the reverse, in keeping old officers and servants on a business establishment when they are past work; but at the same time they cannot be turned off to starve. In most cases the permanence of their engagement has been considered in fixing the scale of their remuneration, which has therefore been kept down too low to permit of effective saving for old age. It is eminently desirable that this question of pension funds should be settled upon some general principle; and the Kettering device is only one method of dealing with it, which we will not at present discuss upon its merits.

Two new clauses are now frequently being introduced into Gas Bills—one defining the period of erroneous registration of a consumer's meter proved to register wrongly; and the other enabling undertakers to ask for payment in advance for supplies required for short periods and under any exceptional circumstances. This latter is a demand that Parliament will do well to watch carefully, lest it should be unduly extended. The same may be said of the usual clause enabling a Gas Company to demand security from an applicant for a supply of gas, which by their statutory obligation they cannot refuse. The Rhyl Gas Bill contains a clause which says:

> Any person having or requesting to have a supply of gas from the Company shall, if and when so required in writing by them, and before he is entitled to have such service-pipe and meter provided and fixed, or to have a supply of gas, give to them such security for the payment by him of the rate for the gas to be supplied to him as he and the Company agree on; and [on] any money deposited as such security with the Company by any person, for the payment to them of all moneys which may become due to them by such person in respect of any supply of gas, or of the purchase or hire of any meter or stove, the Company shall pay interest at the rate of four pounds per centum per annum on any sum of 10s. deposited by way of such security for every six months during which the same remains in their hands.

We give this clause as it stands, because it represents the maximum of a Company's demands. In the Leighton Buzzard Bill and the Kettering Bill the corresponding clause is very short, and runs thus: "If any person is "required by the Company to give to them security for "the payment of the price or rent of a meter, the Com- "pany shall pay interest," &c. This is the minimum demand for security. Moreover, the latter Bill offers 5 per cent. interest on deposits.

The foregoing statement discloses a great discrepancy between the ideas of different gas administrators on this vexed question of security. There can be no doubt, however, in the mind of anyone who can read the signs of the times, that Parliament is not inclined to tighten the power of Gas Companies in this respect. The Rhyl demand is essentially wrong. As it now reads, the Company could require under it every consumer on their books to furnish whatever they chose to exact by way of cash security, or they might refuse to supply him with gas. There being no appeal to a Magistrate, or anybody else in an independent position, to fix the amount of the security at a reasonable figure, in the event of a dispute, the Company would have the public wholly at their mercy. It is safe to predict that this claim will never be allowed. The minimum demand, for security for the value of a meter only deposited upon a consumer's premises, is, on the other hand, reasonable and proper. Gas Companies have allowed red-tape officials to tie them up too tightly and too long with these compulsory deposits (which have driven away more trade than has been compensated for by bad debts saved by their means), to deserve more power of the same kind than they really want. We have only discussed in this article, which has already filled its limits, one or two points of the year's legislative programme. It contains several other matters of interest, to which we shall probably return.

The Glasgow Catastrophe.

THE event of the past week for gas engineers is unquestionably the disastrous occurrence of Thursday last at the Dawsholm station of the Glasgow Corporation Gas Department, when two large gasholders were wrecked, and a great deal of property was damaged by what was reported all over the country in the next morning's newspapers as a great "gas explosion." We have taken measures to obtain as full particulars of the accident as could be supplied for the time being from authoritative sources; and these will be found in another column. It is therefore not our fault if much concerning this extraordinary occurrence remains mysterious. All that is certain is that two out of three holders—triple-lifts—at Dawsholm, something happened while they were two-thirds full to rip open the crowns and ignite the escaping gas. This occurred at a height of 60 feet above the ground, which naturally adds to the mystery. The holders sank, of course, as the gas escaped; a few seconds only seeming to elapse from the first ignition of the gas—which was not more "explosive" in character than might have been expected in the case of the instantaneous inflammation in open air of tens of thousands of cubic feet of it—and there the serious damage ended. The trouble originated with the No. 2 holder, which has just been tripled; and if it is true, as reported, that the job had not been taken over from the contractors, the firm are to be commiserated with upon their heavy loss. The Corporation also will be serious sufferers; and the public must submit to much inconvenience until the holders can be put to work again, for the storeage capacity of the whole undertaking was insufficient at the best. The reflection that must be uppermost in the minds of all gas engineers and managers in reading the account of the affair is: What can have caused it? Mr. George Livesey has inspected the wreck; and if he can form any reasonable hypothesis on the evidence, it will transpire after his report has gone in to the Committee. At present nobody knows whether or not he has been able to frame any opinion on the facts. If he and Mr. Foulis are at fault, it is imperative that a searching public inquiry should be instituted into the affair by the Local Authority. We are under the impression that, according to Scottish law, fire inquests may be held by a public officer. If such is the case, this is a fire that needs to be thoroughly explained. The gas industry cannot be permitted to lie under the suspicion that gasholder crowns 60 feet above the ground are liable to rip up by their own motion. More than this it would not be right to say at present; but we shall, of course, have something more to communicate later on with respect to an occurrence which is certainly one of the most remarkable accidents in the history of gas lighting.

The Plymouth Intimidation Case.

IN another column will be found the judgment of the Recorder of Plymouth (Mr. H. M. Bompas, Q.C.), upon the appeal of three Trades Union Secretaries—Curran, Matthews, and Shepheard—against their conviction by the Borough Magistrates for the offence of intimidating Mr. Treleaven, a coal merchant of the town, for which they were each fined £20, with costs. The appeal

occupied two days in hearing; and, in the event, the convictions were upheld. This decision is of the utmost importance to Trades Unions throughout the country; and therefore it is not surprising that the Executive of the Gas Workers' Union, with the support of the London Trades Council, should propose to take the case further. The facts are not subject to question. Mr. Treleaven was discharging four coal cargoes; three of the gangs being composed of Union men, while the fourth were free labourers. This last gang was objected to by the Branch Union Secretaries, who naturally wanted the monopoly of the trade of the port. They therefore, acting in what they would call their official capacity, warned Mr. Treleaven that if he continued to employ non-society men the rest would be called out. The employer decided not to yield; and consequently the Union men were called out of his ships by the officials named—thereby breaking their engagements. This was done quietly and without actual or suggested violence at the time; but the officials were successfully charged before the Magistrates with "intimidation," under section 7 of the Conspiracy and Protection of Property Act, 1875, which will be found cited in the course of the Recorder's judgment. The question which the Recorder had to decide was whether what was done amounted to legal intimidation, as the Magistrates held that it did; and he decided in the affirmative. It will seem to most people, except the partisans of the New Unionism, that this is a sensible decision, whatever the Superior Court may say as to its legality. Mr. Treleaven was threatened beforehand that something would be done to him if he refused to obey the order of the Union officials. It appears to us that unless this threatened punishment, whatever its shape, was meant to be effective in some way or other, the warning would not have been given. The simple fact of the threat logically entails the consequence of the reality of the punishment. Whether or not the Unionists had threatened definite personal injury to the employer, seems to be an altogether subsidiary point. There are more ways of killing a dog than by hanging him; and it is impossible to argue that what was actually done to Mr. Treleaven was not meant to hurt him—and for what? For doing as he had a perfectly legal right to do—employing non-Union labour. In the course of his remarks on the cause of the trouble, Mr. Bompas went farther than the particular act upon the legality of which he had to pronounce judgment, and declared that while it is lawful for men to strike for objects connected with their own employment, "a strike "for the purpose of compelling employers not to employ "other persons, or to alter the terms of the employment "of such other persons, is illegal, and renders all persons "engaged in it liable to proceedings under this section." This view of the law, if maintained, simply cuts the ground from under the feet of the apostles of the New Unionism, with their schemes of Federation and the rest of it; and unless they can upset it in the Superior Courts, they may as well disband their societies, and return to the subscribers any funds that remain. It is hardly necessary to argue the point as to when the violence that was so conspicuously absent from the initiatory stage of the strike against Mr. Treleaven would have made its appearance; but, seeing that the Gas Workers' Union was mixed up in the business, it may be understood, without much chance of error, that this would have come upon the scene when other courses had proved ineffectual. Mr. W. Thorne, the General Secretary of the Union, has recently found a fresh opportunity for glorifying the rioters at Leeds, whom he credits with having saved the Union; and it is consequently no reproach to him and his subordinates to believe that if the Plymouth branch had needed "saving" in the same way, it would at least have been attempted—unless, indeed, a wholesome respect for the neighbouring garrison had recommended prudence. It will be a distinct gain to the cause of order, however, if Trades Union "intimidation" is held to begin, as it is now reported to have done in the Plymouth case, at an earlier stage of a strike than that of the brickbats.

Title and Index to Vol. LVI.—The title-page and Index to Vol. LVI. of the JOURNAL (July to December, 1890) will be ready at the end of the present week; and, as usual, a copy will be forwarded post free by the Publisher, on receipt of a post-card from any subscriber.

WATER AND SANITARY AFFAIRS.

WE have lately challenged the policy of the London County Council in asking the Government to undertake an inquiry into the question of the Metropolitan Water Supply; the Council having previously obtained from Parliament power to expend £5000 for the same purpose. The manner in which the Council have placed their request before the Government serves now to throw some further light on this subject. The letter addressed to the Marquis of Salisbury by Sir John Lubbock—referred to in another column—reminds us somewhat of the device of the Corporation, who asked that their "inquiry" might be conducted under the direction of a President appointed by the Local Government Board. It may be said that the Council propose for the Government to undertake an independent inquiry, quite apart from their own. We certainly understood this at first; but we are at a loss to reconcile it with the suggestion that the inquiry should be conducted not merely "under the direction," but "with the aid" of Her Majesty's Government. Of course, Lord Salisbury will do as he thinks best in the matter; but the County Council have clearly awoke to the fact that they are not quite strong enough for the undertaking they have contemplated. They state their difficulty to be that they have no power to call upon the Water Companies or other independent bodies or persons to assist them in the inquiry; and, further, any conclusions at which the Council may arrive "will not necessarily be adopted "either by such bodies or by the public." This is true enough. At the same time the County Council need not have despaired of all co-operation on the part of the Companies. The latter have not been wholly unwilling to confer with the Council, though naturally objecting to name a price at which they will surrender their undertakings. In reading Sir John Lubbock's letter, we seem to catch rather a double meaning. One part proposes a purely Governmental inquiry, while another favours the idea that the Council are to have a large share in carrying out the investigation. That the Council should be heard is perfectly right; but this is not exactly the request which they lay before the Premier. The answer received for the present is, "that the matter shall receive "the careful consideration of Her Majesty's Government." Let the decision be what it may, the Council must acquiesce and unquestionably, if the Government touch the matter at all, the "aid" in effecting the inquiry will have to come, not from the Government, but from the Council.

In connection with the letter to Lord Salisbury, it is desirable to see what are the other proceedings of the Council relative to the water supply of London. On Sept. 30, the Special Committee received authority from the Council to prosecute an inquiry into this important matter. Thereupon the Committee instructed the Council's Engineer to submit a report, indicating the heads under which it would be desirable to obtain evidence. On Oct. 8, the Engineer presented a report, reviewing "the "past and recent facts connected with the existing water "supply," besides dealing largely with the future, showing the increasing demand, and the possible sources of supply other than the Thames and the Lea. Such is Mr. Binnie's report, of which some particulars have been given in the "Memorandum" by Sir Thomas Farrer. The Committee are now, according to their own account, "taking the steps "necessary to give effect to some of the suggestions in "the Engineer's report." They are making the investigations which they consider desirable in view of the holding of an inquiry on the question of water supply; and they have "retained some of the most eminent water engineers "to give evidence at such inquiry." Not only so, but the Committee have engaged the services of some "specially "qualified persons" to assist the Engineer in connection with the preliminary investigations—the period of their engagement being for six months. So greatly has the affair grown, that the Committee have found themselves compelled to hire, until March next, temporary offices for the Engineer and his "water staff." Other steps are in progress, tending to make the views of the Council felt on the water supply question. The Committee have already convinced the Council, as expressed in the letter from Sir John Lubbock, that there are strong *primâ facie* grounds for the belief that the present sources of the Metropolitan Water Supply will at no distant period prove insufficient

for the increasing population. On this basis, the argument rests that "an additional supply will soon be imperatively "required." We may presume that the Water Companies are as well informed as the Committee concerning the magnitude of the growing demand; and it is hardly likely that they are at a loss where to look for an adequate source. They are under statutory obligations to meet the demand; and there is no need for the County Council to *pose* as if coming to the rescue for the protection of London against the catastrophe of a water famine. On more than one occasion, the Companies have shown themselves more keenly alive than Parliament to the necessity of enlarging the supply, and obtaining the command of sources adequate for the purpose.

Water Purification by Oxidation.—In the course of a discussion on a paper on the utilization of surface water for drinking purposes which was recently read before the New England Water-Works Association by Professor W. T. Sedgwick, Mr. J. C. Bayles expressed the opinion that it is impossible to devise any system of filtration which shall produce chemically pure water, unless the mechanical process is supplemented by oxidation; and he described an experiment he had conducted to ascertain how this could be done. He built an apparatus similar in character to a gas scrubber, and filled it with coke, the use of which was to break up a column of air introduced under pressure at the bottom with the aid of a blower, and diffuse it. The water, admitted at the top of the vessel, found its way down against the ascending column of air, with a very remarkable result as regards its effect upon the purity of the water. Mr. Bayles had no proper facilities for making a delicate biological analysis of the water. But with such facilities as he possessed, he failed to find, in the water emerging from the purifying process, any trace of organic matter; and he expressed the belief that it had been entirely destroyed by oxidation in the convenient form in which he obtained it. He remarked that care must be taken that the entering air should be as free as possible from impurity and dust.

Students as Meter Inspectors.—A somewhat novel idea has been conceived by the Directors of the Boston (U.S.A.) Gaslight Company for relieving the pressure thrown upon the staff at the time of the inspection of the meters and the presentation of the accounts at the turn of each month. As it takes about five days to read the indices and two to deliver the bills, drafting men from the regular force for this duty simply meant allowing other work to fall into arrear. The idea, therefore, was to get men who could work for a short period for ordinary day wages ($2), and whom it would not be necessary to employ after the special work was done. Wage earners naturally could not engage themselves under such conditions, and the only class that seemed available were the college and high-school students. Accordingly, an advertisement was published, and applications came in fast. The young men came from various schools, as well as from Boston University and Harvard College. About 25 men are employed in going the rounds; and although the pay is neither high nor constant, it is regular and certain. Some fears were felt at first that they would not be fitted for such employment, since they have to go into all kinds of places, and, if ruffled by snubs and disagreeable treatment, might reply impertinently. It appears that some complaints have reached the gas office from consumers; but generally the work is being satisfactorily done, and the experiment is regarded as a success. The plan is not only advantageous to the Company, but a great assistance to poor students.

Sudden Death of Mr. Alfred Hersee.—On Wednesday morning last, soon after reaching the office of the Oriental Gas Company, to attend a Board meeting intended to be held that day, Mr. Alfred Hersee, the Secretary, called for assistance, but, before any could be efficiently rendered, he fell down and expired. He had long suffered from heart disease; and Sir Andrew Clark had considered it prudent to inform him of his danger. Mr. Hersee had held the appointment of Secretary to the Oriental Gas Company for about 30 years, and had fulfilled its duties in such a manner as to secure the good will of all with whom he became connected. His application to business was of the closest nature; and he grappled with every matter so thoroughly as to master its smallest details. His unimpeachable integrity assured him of the high esteem of all who knew him. He was one of the Auditors of the British Association of Gas Managers, and afterwards of The Gas Institute for many years, until early in 1889, when he resigned with his colleague, Mr. Alfred Lass. He was also Auditor of the Continental Union Gas Company, of the Malta and Mediterranean Gas Company, and of Messrs. W. Sugg and Co. He was the Secretary of the Mauritius Gas Company; and those who knew him best feel certain that his constant anxiety and unceasing efforts to avert the failure of that unfortunate undertaking hastened the fatal result of the disease with which he was afflicted. He leaves a widow, three sons (the eldest of whom is deaf and dumb), and numerous other relatives and friends, to mourn his loss. It is singular that Mr. H. J. Baddeley, who preceded him as Secretary of the Oriental Gas Company, died only a few months ago.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 123.)

THE course of the Stock Markets during the past week has been, on the whole, satisfactory in regard to the matter of improved prices. Still, the period has been somewhat chequered; owing partly to great caution being yet evinced by investors, partly to snapping profits when they showed out, and partly to special circumstances affecting certain securities. With reference to the last-mentioned factor, the railway companies' accounts are of high interest; revealing, as they do, the greater or less extent to which the companies have suffered owing to the enhanced cost of coal and labour. This is a topic which cannot fail to possess an engrossing interest to gas proprietors, and to which we have more than once adverted. No more, however, need be said in anticipation, as some official announcement, affording a clue to the position of some of the chief undertakings, may shortly be looked for. The Money Market is extremely easy; and the Bank rate of 4 per cent. will probably bear reduction. The Gas Market is at the present time active and very firm. The heavy stocks are in special demand; and prices keep moving up. All Gaslight issues have been brisk. The "A" opened at 246 on Monday, and touched 252 on Wednesday; but this figure was not reached again. However, the quotation comes out 3 higher. Unusually extensive business was done in the debenture, preference, and maximum issues, which were generally firm, and some of which advanced. South Metropolitans have been very lively; and a good deal of business was done in "A." Both "A" and "B" have advanced 2. Commercials are unchanged; and one transaction in each issue is all the record of the week. Suburban and Provincial undertakings continue extremely inactive, and present nothing for remark. The only transactions in them were one in Brentford, and one in British. The Foreign division, however, have been active, especially Imperial Continental. High as it was in the previous week, it is now even 2½ higher; and it has changed hands more than once at the unprecedented figure of 230½. The rest were uneventful, but generally firm; except Bahia, which has receded 1. The Water Companies have been more than usually busy; and, under the influence of a good demand, several have improved in value—Grand Junction taking the lead with a 6 per cent. advance.

The daily operations were: Gas opened firm on Monday; prices for the new account being much better. Gaslight "A" and Imperial Continental rose 1 each. Gas was better still on Tuesday. Gaslight issues of all sorts were brisk and buoyant. The "A" rose 2; and the 6 per cent. debenture, 1. Imperial Continental improved 1½. Bahia fell 1. Wednesday's transactions were mostly in Gaslight "A" and Imperial Continental, which were very firm, but unchanged. Prices were good all round. Water stocks were disposed to rise generally; but the only actual move was an advance of 2 in Lambeth 10 per cents. Progress in Gas was well maintained on Thursday. Gaslight "J" and South Metropolitan "A" and "B" advanced 2 each. Unusual demand for Water, especially for debenture and preference issues. On Friday, Gas Stocks in general were active and very firm. The only change was a rise of 1 in Gaslight 6 per cent. debenture. Water was quiet; but quotations were advanced. Grand Junction rose 3; and Kent and Lambeth 10 per cents. 1 each. Saturday was proportionately busy, and was firm. Gas quotations were unchanged; but in Water there was a rise of 1 each in East London and West Middlesex.

ELECTRIC LIGHTING MEMORANDA.

Mr. W. Crookes's Address to the Institution of Electrical Engineers—The Affairs of Woodhouse and Rawson United, Limited—The Comparative Cost of Electricity and Gas—The Cost of Electric and Steam Locomotion.

IN another column will be found an abstract of the address delivered by Mr. W. Crookes, F.R.S., on the occasion of his inauguration as President of the Institution of Electrical Engineers. The whole address is of an abstruse character, and practically beyond criticism. When a man is chosen for the office of President of a Scientific Society, with the understanding that he is to pronounce an authoritative oration upon subjects concerned in the particular branch of science cultivated by his supporters, he must be left to exercise his own discretion as to what his discourse shall be. Mr. Crookes's observations undoubtedly make tough reading even for those who can lay claim to more than a smattering of science. But there is some satisfaction in the thought that there is nothing better of the kind to be obtained; and therefore that if Mr. Crookes cannot materially advance our knowledge of the constitution of matter, and so forth, nobody else can do more. It is at least creditable to the new President of the Electrical Engineers that he did not waste time in recapitulation of the doings of electricians for the past year. This kind of presidential address is the most

superfluously wearisome of all; and it is better for an occupant of a presidential chair of a Scientific Society to hold his hearers gasping over the brink of the Infinite, as Mr. Crookes did, than to plague them with retrospective matter that any newspaper chronicler could do as well.

There has been an extraordinary general meeting of the shareholders in Woodhouse and Rawson United, Limited, for the purpose of authorizing the Directors to relinquish possession of a sum of £75,000 arranged by the promoters to be deposited with the Company until July, 1892, as a guarantee of dividend; and also to increase the capital of the Company by the issue of new shares to the nominal amount of £200,000. The Company still have some uncalled capital; but the Directors prefer to increase their resources in the manner specified. We have already remarked on various occasions that Woodhouse and Rawson finance is of a kind that surpasses our comprehension, and therefore we do not propose to discuss this last operation. It may be supposed that all these proceedings are necessary and correct, since the shareholders agree to them; but whatever it is that brings "grist to the mill" of the Woodhouse and Rawson concern, it is not electric lighting. This Company are promoters of others, besides doing a manufacturing business of their own. They keep clear of lighting, however; and consequently their success, such as it is, cannot be directly connected with the electric lighting industry.

It is with considerable satisfaction that we find our rule of comparing the price of gas at per 1000 cubic feet with electricity at per Board of Trade unit supported by the *Electrical Review*. While earnest and even enthusiastic supporters of electric lighting, the conductors of this publication exhibit a praiseworthy solicitude that their cause should not be recommended anywhere by false pretences. Thus they recently published an article condemning in the strongest terms a report made by Mr. J. A. Timmis to the Corporation of Dover, upon their proposal to set up an electric lighting plant for the town. They would not even reprint this report, which they cruelly described as "too funny for the *Electrical Review*;" but the indications they gave of the heads of this production sufficiently disclose its character. Mr. Timmis's estimate for the town plant worked out to 30s. per lamp, which one scarcely requires to be told is hardly one-half the probable expense. Then, the *Electrical Review* goes on to state: "In comparing the cost of gas with electric light, Mr. Timmis again goes astray. The cost of lighting by electricity at 7d. per unit is equal to paying about 7s. per 1000 cubic feet for gas; and at 1s. per unit, it is equal roughly to gas at 12s. per 1000 cubic feet—not 6s., as their adviser would have the Dover Corporation believe." It will be seen that, in making their comparison, the *Electrical Review* use 12 as a constant for converting the price of electricity per unit into gas at per 1000 cubic feet. We use 13, after Professor Forbes; but the difference is not serious, and may, indeed, be neglected in the case of 14-candle gas. Once more, Mr. Timmis has recommended the Dover Corporation to adopt incandescent lamps for street lighting, for which purpose they have failed everywhere; and on this point our contemporary declares that "the one thing electrical engineers of repute in this country are agreed upon is that it would be utter folly attempting to employ incandescence lamps for street lighting, whatever their candle power, if it is desired to compete commercially with gas." Has the great Mr. Preece changed his mind once more, then, with regard to this question?

A good deal will have to be done yet to make the City and South London Electrical Railway permanently popular; but nobody wishes to be hard on a new enterprise, the conduct of which will doubtless be improved by experience. People complain of stoppages in the middle of the tunnels, bad lighting, and the inefficient working of the electric lifts at the stations; but these are small matters. The *crux* of the system, as we pointed out at the first, will be in the cost of the electrical haulage. Some not very reassuring information upon this head may be obtained from a report by Mr. Lincoln Moss, of the Engineer's Department of the New York Elevated Railroad, upon comparative tests of an experimental "direct" system of electrical haulage and of the ordinary steam locomotion of the line. The system in question was the Daft, which is described as the only one which had been so far developed as to be recognizable as a possible competitor with the steam locomotive. The electric generating plant employed was fairly good, but not up to the City and South London Company's standard; and the trains were heavier. After all, however, Mr. Moss found that "the cost of direct electric propulsion would be four times that of steam locomotion;" which is a sufficient reason why his Company could not see their way to the present adoption of the former system. From the silence that is being maintained respecting the results of attempts to apply electrical locomotion to the Metropolitan Railway, it may be surmised that Mr. Moss's results have not yet been upset in this country. Of course, these remarks apply only to full-size railways; and light tramways like that between the City and Stockwell may offer more favourable conditions for electrical haulage. Still, making all possible allowances, a difference of cost of four to one is a serious matter; and very good business must be done in order to pay for it. It remains to be seen whether the other economies of a small subterranean railway, as compared with the cost of working an ordinary line, are sufficient to allow for a heavily increased bill for motive power.

THE FRENCH COMMISSION ON GAS MANUFACTURE.

Our readers are aware that about a twelvemonth ago the French Minister of the Interior, acting under the powers vested in him by the 48th article of the Treaty entered into between the Paris Gas Company and the City authorities in 1870, nominated a Commission to investigate any new process in connection with gas manufacture, introduced during the five years from 1885 to 1890, which could legitimately be said to constitute an improvement likely to effect a notable reduction in the net cost of gas, and to indicate such improvement to the Administration, with the object, if it had not already been brought into use by the Company, of enjoining it upon them for the benefit of the consumers. The investigation extended practically over the year; the result being the presentation of a voluminous report, the conclusions of which were given in the Journal for the 9th ult. (p 1189). Our readers may remember that these were not of a character to warrant any mandatory action being taken against the Company; and, in view of this fact, it may be of interest to give a short account of the proceedings of the Commissioners, in order to show how they discharged the duty entrusted to them.

The Commission was nominated on Jan. 31 last year—the members being MM. Bochet, Cornuault, Lippmann, De Luynes, Potier, and Vieille; and a preliminary meeting was held at the Hôtel de Ville, Paris, on the 28th of the following month. The members were received by M. Alphand, Director of Works, as representative of the Prefect of the Seine, who explained to them the nature of the inquiry they were to undertake. Being asked to specify the "new processes" which the Administration wished the Commissioners to investigate, he replied that they knew of nothing to which to call special attention. Thereupon M. Alphand retired; and the Commissioners proceeded to business. They first elected M. Bochet their President (M. Potier to act in this capacity in his absence); and next appointed M. Cornuault as Secretary. Views were then exchanged as to future proceedings; and, in order to have a definite basis on which to commence, the Secretary was instructed to prepare a *résumé* of the knowledge on the question—the Commissioners' intention being to investigate all the new processes, improvements, &c., connected with gas manufacture, which could be brought before them, whether or not they had been adopted by the Paris Gas Company. The next meeting was held on the 15th of March. In accordance with his instructions, M. Cornuault prepared and presented a summary of the work of the preceding Commission, whose investigations embraced the period from 1880 to 1885; and the Commissioners decided to conduct their inquiry on similar lines—to call before them expert witnesses and visit gas-works. The persons whose positions seemed to mark them as specially capable of assisting the Commissioners were the President of the Société Technique du Gaz en France (M. Le Treust), the Managers of various gas companies—French, English, and German—and inventors of gas appliances. M. Raoul Duval, Chairman of the Paris Gas Company, and M. Godot, Deputy-Superintendent, representing M. Camus, the General Superintendent, were introduced, and, in reply to the President, stated that the Company had not adopted any new manufacturing processes, and that the alterations which had been made in the plant and works could in no respect be regarded as inventions or improvements in the sense indicated in the article of the Treaty under which the inquiry was being held. M. Duval described the process of gas manufacture in its various stages, and gave further explanations in answer to questions put by the members of the Commission. This brought the sitting to a close; but before adjournment it was decided to commence the visits to works on the 2nd of the following month—beginning with the Villette station of the Paris Gas Company. Accordingly, the members assembled at those works on the day named, accompanied by M. Huet, Sub-Director of Public Works, who represented the City. They were met by M. Duval and several of the Company's officials, one of whom (M. Godot) explained the general arrangement of the station. Commencing with the experimental works, which are under the direction of M. Sainte-Claire Deville, a thorough investigation took place of the various processes of testing coal, analyzing gas, &c., carried on there. The ordinary gas-making plant was then examined; and the visit closed with an inspection of the coal and coke stores station meters, gasholders, and valve-house. The next meeting was held on the 12th of April, when M. Le Treust, Superintendent of the Amiens Gas-Works, was in attendance. Questioned by the President as to any processes foreign to the present system of gas manufacture which have been introduced during the past five years, he replied that, as far as he was aware, there were none in existence. With regard to improvements, he thought he could best indicate these by offering a few general remarks on the various manufacturing appliances. Dealing first with the handling of the raw material, he pointed out the different improvements which had been made; but these could not, he said, be regarded as new processes of manufacture. Distillation was still effected in clay retorts, charged mainly in the old way by the scoop and shovel, although M. André Coze had endeavoured to simplify the work by constructing settings of inclined retorts to be filled mechanically. Passing on to discuss the subject of heating the retorts, he said he had unhesitatingly come to the conclusion that the adoption of regenerative furnaces had not resulted in any great economy

in the cost of manufacturing gas. In the operations of condensation and purification, certain changes had been introduced; but they had not modified to any appreciable extent the expense attending this branch of the work. With regard to the Dinsmore process, M. Le Treust considered it to be too complicated to revolutionize the gas industry; and he believed it would meet with the same fate as its predecessors. In conclusion, he directed the attention of the Commissioners to the very important part played by the price of raw material in connection with the net cost of gas. He pointed out that in looking merely at the manufacturing operations, only the smallest side of the question was regarded, inasmuch as the cost of coal and labour, which is altogether beyond the control of gas companies, amounts to something like 80 per cent. of the total outlay necessary for the production of a given quantity of gas. After M. Le Treust came M. Ancel, Manager of the Lyons Gas-Works. He said he did not know of any process of gas manufacture foreign to the system actually employed by the Paris Gas Company. He gave particulars as to the consumption of coke in regenerator and ordinary furnaces, and discussed the advantages and inconveniences of the two systems. He dwelt upon the importance of a good system of distribution—having all the mains sound, and the joints staunch. In his opinion, the methods employed by companies for disseminating knowledge as to the numerous applications of gas, and the sacrifices they have made in order to bring it within reach of the smallest consumers, constitute the greatest progress that has been made in connection with the gas industry for some years past. The prosperity of gas companies should not, he thought, be attributed to a reduction in the net cost of production resulting from the adoption of new manufacturing processes. It was due, in a great measure, to the progress made in the commercial part of the undertaking —in other words, to the development of gas consumption. At the close of M. Ancel's remarks, the Commission adjourned to the 26th of April, when they paid a visit to the Clichy works of the Paris Gas Company.

The inquiry was resumed on the 3rd of May; the entire sitting being occupied in hearing from M. Coze a description of his system of inclined retorts, as in operation at Rheims and elsewhere. He claimed that its adoption would result in a saving of 50 per cent. for labour; and he produced some statistics, extracted from the books of the Rheims Gas Company, to show that, comparing two settings of nine retorts—one on the inclined, and the other on the horizontal system—there was a greater weight of coal carbonized (to the extent of about 3¾ tons) and a larger yield of gas per 24 hours, coupled with more work done by the men, with the former than with the latter. It had, he said, been objected that the system was costly to introduce. In disproof of this, he submitted an estimate for a bench of six settings of nine retorts, placed back to back; the total being 64,616 frs. (£2584), exclusive of royalty. He thought these figures would show that settings of retorts on his system were not more costly than those on the horizontal plan; and they might, in fact, be regarded as more economical, if account were taken of their higher production. After M. Coze had retired, the Commissioners decided to visit the gas-works at Rheims. The next meeting was on the 13th of May, when M. Alavoine, Manager of the Beauvais Gas-Works, attended, and described the improvements effected in his hydraulic main furnished with strainers for separating the tar and ammoniacal liquor, which was described and illustrated in the JOURNAL at the time of its introduction a few years since. The appliance was tried by the Paris Gas Company at their Boulogne works in 1885; and although they found, like M. Alavoine, that there was a rapid condensation of the tar, there was also (owing possibly to the different conditions of working) a diminution in the illuminating power of the gas, and trouble from the deposition of naphthalene the moment the gas was cooled down to the outside temperature. M. Alavoine admitted that the appliance would not reduce manufacturing expenses to any considerable extent; its recommendation was rather on the score of convenience. At the same time he believed some economy in the cost of condensation and purification might be effected by its use. M. Alavoine was followed by M. Melon, Manager of the Lille Gas-Works, who reviewed the various phases of gas manufacture, and said he did not know of any new systems apart from those adopted by the Paris Gas Company. He criticized the Coze arrangement and the Dinsmore process; and concluded by saying that in large gas-works, furnished with plant which has been recognized during the past twenty years as the most suitable, the technical improvements possible would have no appreciable effect on the net cost of gas, which varies notably with an increase in the day consumption, and depends essentially on the price of coal and residual products.

The next four meetings were devoted to visits to Rheims, the Paris Gas Company's station at Le Landy, one of the gas-works (No. 4) of the Berlin Municipality, and the Erdberg station of the Imperial Continental Gas Association in Vienna. On July 26 further evidence was taken. M. Emile Coze pointed out the changes he had made since 1885 in his method of hot condensation; M. Riboulet laid before the Commission his views on gas manufacture, the abolition of retort-settings, &c.; and M. Jouanne, the agent in France for the Dinsmore Company, described their process, and explained what had been already effected therewith in England, and what was about to be done in France. At the next meeting, which took place on the 2nd of August, the Commissioners reviewed their labours up to date, and came to the conclusion that they had heard and seen sufficient to enable them to consider their report; and M. Cornuault was entrusted with its preparation. In the meantime, Mr. H. M'Lauchlan Backler, Chairman of the European Gas Company, submitted for the consideration of the Commission a few observations on the position of gas manufacture in England. He remarked that, although the considerable rise which has taken place in the cost of coal and labour, coupled with the competition of the electric light, is a powerful incentive to English gas managers to endeavour to find some means of producing gas at a lower price than formerly, the actual progress made has, he regretted to say, been very slight, if indeed there has been any. He referred to the Coze system, and to the arrangement of inclined retorts with division-plate devised by Mr. G. C. Trewby, as steps in advance; but he pointed out that they involve a reconstruction of the existing settings, and also the delivery of the coal at a higher elevation than is now customary. He acknowledged that the system might, in the future, render strikes of stokers less disastrous for gas companies than they are at present. The other subjects touched by Mr. Backler were the Dinsmore process, the carburation of gas in bulk, regenerative furnaces, mechanical stoking, condensation and purification, and gasholder construction; but he was unable to say that any of them had been productive of definite economy in the net cost of making gas. In fact, as the result of skilful administration, and careful supervision in the matters of the purchase of raw material and of maintenance and repairs, gas was now made with the least possible expenditure. Signed statements, in support of the evidence given before the Commission, were sent in by M. Camus and M. Duval (on behalf of the Paris Gas Company), as well as by the various witnesses.

After a two months' interval, the Commissioners met on Oct. 18, when M. Cornuault submitted his draft report, which was discussed at two subsequent meetings, and finally adopted unanimously on the 20th of November. Its conclusions have been already given in the JOURNAL; but it may be convenient to recapitulate them. The Commissioners expressed the opinion that the Coze system was the only new "process," in the terms of the article of the Treaty under which they had been acting, which was susceptible of practical application in connection with gas manufacture, although it had not been sanctioned by experience, except to a limited extent. They acknowledged that the adoption of the system would lighten the labour of the stokers; but they refrained from saying anything on the subject of its economy. The Paris Gas Company had already experimented with the system; but the Commissioners did not think the Company could be ordered to adopt it permanently. They added, in conclusion, that a careful investigation of all the elements constituting the net price of gas showed clearly how largely the commercial question preponderates over that of manufacture; and that, in the present position of the gas industry, a notable diminution in the net cost of production must be influenced by causes quite apart from manufacturing processes.

GAS BILLS FOR 1891.

In accordance with our ordinary practice, we now present our readers with a summary of the Private Bills relating to gas supply awaiting the consideration of Parliament, which will re-assemble next Thursday.

Five Bills relate to the incorporation of new or existing limited liability Gas Companies with statutory powers. The Garw and Ogmore Gas Bill contemplates the incorporation of a Company with a share capital of £20,000, and power to borrow £5000, for the purpose of supplying a new district in the neighbourhood of Bettws, in Glamorganshire. The maximum price for 14-candle gas is proposed to be fixed at 6s. per 1000 cubic feet. The now usual clause limiting the period of error for defective meters is included in the Bill. The Kettering Gas Bill is to incorporate the Kettering Gas Company, Limited, who were formed in 1882, and in the same year obtained a Provisional Order defining their capital as consisting of £20,000 original 10 per cent., and £10,000 additional 7 per cent.; all new capital being made subject to the auction clauses, and the sliding scale imposed with 4s. per 1000 cubic feet as the initial price. At the present time the paid-up share capital consists of the £20,000 of original, and £6500 of new capital; and the Company have borrowed £7500 on mortgage. The Bill proposes to dissolve and re-incorporate the Company with extended limits comprising nine Northamptonshire parishes. The capital is to be increased to £80,000, by the addition of £50,000 worth of new shares, all apparently intended to carry a 10 per cent. dividend. The borrowing powers are to be enlarged to one-third of the paid-up capital. The price of gas in the new outlying district is not to exceed 1s. per 1000 cubic feet more than that charged for the time being in the home district. A clause in the Bill relates to the establishment of a reserve fund out of divisible profits; the amount of the fund and its application to be in the discretion of the Company. Another clause proposes the creation of a pension fund out of the divisible profits above 10 per cent., subject to the

consent of a general meeting. It is also proposed to erect workmen's cottages. Permission is sought to convert the existing 7 per cent. into 10 per cent. capital, of proportionally smaller amount, by consent of three-fifths of the shareholders. The Leighton Buzzard Gas Bill is to incorporate a Limited Company formed in 1835, and registered under the Joint-Stock Companies' Act in 1857. The capital of the old Company consists of £12,106 10s., divided into 450 shares of £21, and 250 shares of £10 10s. each, all fully paid up. There is no loan. The capital of the new Company is to be £27,106 10s., whereof £15,000 is to be the additional 7 per cent. capital issued under the auction clauses. All the original capital is to be converted into stock at the first ordinary meeting held after the passing of the Act. Borrowing powers are asked for to the extent of £3000 on the original stock and one-fourth part of the new capital as issued. The maximum price of 15-candle gas is to be 5s. per 1000 cubic feet within a radius of one mile from the Market Cross in the town, and 6s. beyond. A clause is inserted in the Bill to enable the Company to require payment in advance for gas demanded for short periods of six months or less; allowing 4 per cent. interest upon such prepayments. The Partick, Hillhead, and Maryhill Gas Bill is for the purpose of incorporating with statutory powers this limited Company, which was formed in 1871, and now has a share capital of £130,000 and a debenture debt of £14,390, and has raised £55,100 by debenture stock, and agreed with certain shareholders for the issue of £24,900 of additional debenture stock for the purpose of paying off the debenture debt, and for the general purposes of the undertaking. The preamble of the Bill recites how the Glasgow Corporation came to be competitive suppliers of gas in the district served by the Company, and states that the Corporation are promoting a Bill in Parliament for extending their municipal boundaries, the effect of which would be to constitute them the local authority for, as well as competing suppliers of gas in the Company's district. It is proposed to raise the capital of the Company to £250,000, whereof £100,000 of ordinary, and £30,000 of preference capital are called the original capital and the remaining £120,000 is to be additional 7 per cent. capital. The original capital is to be divided into 10,000 ordinary £10 shares, and 3000 preference 5½ per cent. shares. The holders are to be entitled to a fixed cumulative preferential dividend after the stated rate, which is to be independent of the sliding scale, and to form a first charge upon the net profits of the Company. In the event of any deficiency of the amount required to pay this charge, it is to be made good from the revenues of future years, but without interest on the arrears. Borrowing powers are required to the amount of £80,000 in respect of the original capital, to include the sums already borrowed, and £20,000 on the new capital. It is desired to issue 4 per cent. debenture stock to the extent of the borrowing powers. The Bill proposes 2s. 6d. per 1000 cubic feet as the initial price for 20-candle gas, tested on the works. In the event of the extension of the municipal boundaries of the city of Glasgow, the Corporation are bound, if called upon, to purchase the portion of the Company's undertaking situated within the annexed area. If this area embraces more than one-fifth of the Company's gas supply, or so much "as to render the profitable prosecution of the Company's business within the remainder of the limits of the Act impossible or doubtful, the Company shall be entitled to call upon the Glasgow Corporation to purchase, and the Glasgow Corporation shall be bound, if so called upon, to purchase, the whole of the Company's undertaking;" any dispute respecting the extent of the annexed area to be settled by arbitration. The Corporation are to have the option of selling portions of their undertaking to the Company, instead of acquiring that of the latter. In case of a partial sale of the Company's undertaking, the amount realized is to be applied to capital purposes. In the event of the entire undertaking being purchased by the Corporation, the price is to be fixed on the footing of this body taking over all the liabilities of the Company; the arbitrators having power to fix the date of transfer and decide all other questions arising out of the operation. The undertaking, inclusive of the insurance and reserve funds, is to be transferred to the Corporation as at the date of the transfer, subject to payment of the price of the same, and of the debts, liabilities, and obligations of the Company, and of perpetual annuities in lieu of the annual interest on the debenture stock. The unexhausted borrowing powers of the Glasgow Corporation are to be made applicable to the objects of the Bill. The Rhyl Gas Bill is to incorporate a limited Company formed in 1869 to buy the old gas-works, established originally in 1848. The present share capital of the Company consists of £20,000, and there is no loan. The limit of the statutory Company's district is to be a line drawn at a radius of two miles from the Rhyl Town Hall. Additional capital amounting to £18,000 is asked for, with power to borrow £5500 upon the old capital, and £4500 upon the new. The initial price of 4s. per 1000 cubic feet is asked for 15-candle gas. The Directors seek power to declare interim dividends half yearly, without calling a general meeting. If any consumer wastes gas or does anything in contravention of the terms of the Act, his gas is to be cut off, and the amount of damage recovered summarily. The average meter system is to regulate the charge for the public lighting. No penalty for bad gas or insufficient supply is to be recoverable against the Company if it can be shown that the default arose through an unavoidable cause, strikes, or accidents; and no penalty shall be incurred on account of the temporary non-supply of gas in consequence of main laying.

The Brentford Gas Bill recites in the preamble that doubts have arisen with regard to the procedure for cutting off gas from the premises of defaulting consumers; and it proposes to deal with this matter as was fully described in the JOURNAL for Dec. 23, p. 1280. The Bristol Gas Bill is for the purpose of changing the name of the Company from the Bristol United Gaslight Company to the Bristol Gas Company. The present authorized capital, amounting to £511,250, bearing a 10 per cent. dividend, is to be made convertible into £1,022,500 of 5 per cent. capital; and the unissued portion of this capital, amounting to £67,000, is to be similarly treated. The borrowing powers are to be enlarged to one-third of the share capital paid up. The Company also desire power to supply gas in bulk beyond their own limits; and to supply gas-fittings, &c. The Filey Water and Gas Bill is to enable the Company to increase their capital by £14,000 for general purposes, and for paying off a debt of £3776. In addition to their existing borrowing powers, the Company desire to borrow sufficient to pay off the debt named, upon the security of their old capital, and also to borrow £3500 upon the additional capital. The Company's gas is to be tested upon the works according to the 1871 Act. The Gaslight and Coke Company's Bill is for the same purpose as that of the Brentford Company alluded to above; and it was dealt with in the December number already mentioned. The Stourbridge Gas Bill is to confirm a purchase of land, and to enable the Company to do as they please on it. A delimitation agreement between the Company and the Brierley Hill Company is also to be sanctioned. The rates of dividend borne by different descriptions of the Company's share capital are to be re-arranged and defined afresh; and the sliding scale is asked for, with 3s. 3d. per 1000 cubic feet as the initial price. With regard to the rate for public lighting, it is proposed that the Company shall not charge any local authority a higher price for gas than is paid by any private consumer "otherwise than under a special contract in writing." Lamps and fittings are to be supplied by the Company, and 5 per cent. charged on the cost thereof.

The Whitehaven Town and Harbour Bill is to empower the Local Authority to compulsorily acquire the gas undertaking of the limited Company now supplying gas in the district, at a price to be settled by arbitration, which powers are to be exercised within five years. Gas of 16-candle power is to be supplied, at the maximum price of 3s. per 1000 cubic feet. Works for the production and supply of gas and electricity are to be sanctioned; and sums of £24,000 and £1000 are to be borrowed for these purposes respectively. The Birkenhead Corporation Bill contains a clause to provide that nothing in section 73 of the Wallasey Local Board Act, 1890, shall authorize the Board to supply gas or water in any district or place which was previously within the district of supply of the Birkenhead Corporation. The Edinburgh Municipal and Police Bill contains provisions requiring owners of courts and common stairs to provide lamps and gas or other lighting for such places, under a fine of 40s. per day for default. Magistrates and the Council of the city are also to be empowered to supply such lights, and charge the owners with the cost, which is in such case not to exceed 40s. per annum. The Glasgow Boundaries Bill is the measure alluded to in the Partick, Hillhead, and Maryhill Company's Bill already noticed. It does not make any mention of the Company, but proposes to include their district in the extended area of the City and Royal Burgh. A clause is inserted in the Bill, however, providing that the Public Commissioners, in their capacity as road authority, "shall grant to any company or person at present supplying gas within the district added, all reasonable facilities for laying down, repairing, altering, renewing, or moving gas mains or pipes now existing within the district added, or which any such company or person may hereafter require to lay down for the purpose of their existing supply or any extension thereof;" the Sheriff to be the judge in any difference that may arise between the parties. The Nelson Corporation Bill contains a clause to extend the limits of gas supply, and another to amend the composition of the Corporation Gas Committee.

The Bowman's Oxygen Lighting Company are promoting a Bill which does not come into any of our ordinary categories of gas lighting legislation. It is to enable the Company to establish works and lay mains in the Metropolitan area for the supply of oxygen alone or in conjunction with coal gas. The Company propose to lay themselves under the same obligation to supply that operates in the case of ordinary gas companies, and accordingly to adopt section 11 of the Gas-Works Clauses Act, 1871. Sanction is asked for any working agreement entered into by the Company with any local authority or gas company in the Metropolis for supplies of oxygen made by the Bowman process. Right of entry is also demanded for premises to which oxygen is furnished. Supplies are to be given by meter for agreed prices; and rents are to be recoverable summarily.

Gas Officials' Salaries at Bolton.—The Gas and Lighting Committee of the Bolton Corporation resolved last week to advance the salary of Mr. W. Smith, the Gas Engineer, by £100 per annum. The salaries of other officials of thep mentepart are also increased.

NOTES.

The Sulphur in Mineral Oils and Natural Gas.

The investigations of many competent observers upon the characteristics of petroleum and natural gas tend to indicate, by way of explaining some of the most striking differences between several descriptions of crude mineral oils, that these may be possibly divided into two varieties, distinguished by their probable origins. Oil and gas coming from sandstone formations and bituminous shales, especially as found in Pennsylvania, and constituting the bulk of the merchantable lighting oils drawn from this region, are ascribed to a vegetable origin; while oil and gas from limestone have been generally referred to animal matter in decomposition. The latter have disagreeable odours, and abound in sulphur, which unfits them for illuminating purposes. The oils and gases of vegetable origin also contain sulphur, like all gas coals; but not in such high proportions. The sulphuretted hydrogen in the limestone gases of Ohio and Indiana runs from 0·15 to 0·21 per cent., while hardly a trace of this impurity occurs in the Pennsylvania gas. Professor C. C. Howard is the authority for the statement that the natural gas of Findlay, Ohio, contains 125·8 grains of sulphur in 100 cubic feet. One well has for years produced 12 million cubic feet of such gas per day, which argues a vast amount of chemical reaction in the fissures of the rock. Mr. J. F. Kemp, writing in the *Engineering and Mining Journal*, seems to expect that when the gas is all gone, the rocks which have yielded it will be found to be full of precipitated metallic deposits, due to the reduction of sulphides by the gas.

Oil for Gas Exhausters.

According to a communication by Mr. A. C. J. Charlier to the *Engineer*, on lubricating oils, which contains a good deal of miscellaneous information on the subject, as the best oil for heavy machinery bearings, among which may probably be classed those of gas exhausters, castor oil has no equal. This oil should be unadulterated if it is to do its work effectually; but it is often sophisticated with lard oil and colza, both of which differ considerably from it in density. Pure castor oil has a specific gravity of ·960; lard oil, of ·916; rape oil, ·912. Consequently, if the specific gravity of a sample, as tested by the hydrometer, falls below ·955, the presence of one of these oils is indicated. Another very characteristic test of castor oil is by the addition of zinc chloride. If pure, the mixture turns yellow; if lard oil is present, it becomes milky; and it turns green for colza. Sperm oil is also tested in the same way. If pure, it becomes milky with zinc chloride; but when adulterated, it turns brown.

Deducing the Calorific Value of Coal Gas from its Specific Gravity.

According to Dr. Slaby, writing in the *Journal für Gasbeleuchtung*, while the determination of the calorific power of coal gas is a most important datum for all calculations relating to its application, it is not an easy thing to obtain by the delicate methods of Berthelot or Thomsen; while the composition of such gas varies too much to permit of its calorific value being computed from analyses by taking a mean. In comparing the determinations effected by Thomsen with the specific weights of the various carburets to be found in illuminating gas, it appears that if we designate by H the quantity of heat disengaged by the combustion of a cubic metre (water as steam), and by E the specific gravity of the gas, the formula $H = 1000 + 10{,}500\ E$ gives results perfectly concordant with those found by direct experiment. For the determination of the specific gravity, Schilling's apparatus is employed by Dr. Slaby, with a slight modification devised by Bunsen. It is based upon the fact that the densities of two gases are inversely proportional to the squares of their velocity of discharge through a small orifice, the pressure remaining constant. In Schilling's apparatus, the gases are in contact with water, and not with mercury; they may consequently be regarded as saturated with humidity. An approximate calculation of a very simple character shows that if we designate by d the density of a gas in the saturated condition, and dry gas by d^1, under equal conditions of pressure and temperature $d = 1{\cdot}017d^1$. For the rest, in correcting the indications of the Schilling apparatus by direct weighings of gas carried out with all imaginable precautions, it has been found that the difference does not exceed 0·07 per cent. for the specific gravity—which is more than sufficient precision.

Water v. Producer Gas for Fuel.

It is well known that one of the economical drawbacks to the extension of water-gas plant for industrial purposes is the difficulty of profitably utilizing the producer gas which is generated in the process of blowing-up the fuel in the cupola to the temperature necessary for making the water gas, and which represents three-fourths of the whole fuel consumption. Mr. F. E. Ross, writing to *Engineering* on this subject, very neatly sums up this difficulty. He says that he cannot see how 3000 cubic feet of producer gas can be conveniently applied to raising steam and heating air for every 1000 cubic feet of water gas made; and he observes that it must be more economical to burn the two gases together in the furnace than to separate them for the purpose of showing a higher calorific value for the small proportion which water gas forms of the whole. Assuming, he remarks, that three volumes of producer gas are burnt to make steam and heat the air for the production of one volume of water gas, then as much fuel (gaseous and solid) has been consumed in the production of that one volume as would have gone for the production of *four* volumes of producer and water gas mixed, in an ordinary gas generator using similar fuel and supplied with steam. But since the calorific value of *three* volumes of this mixture is equal to that of one volume of water gas, it follows from Mr. Ross's argument that the useful effect of a given weight of fuel must be about 25 per cent. less when treated in a water-gas plant than in an ordinary gas-generator furnace. As regards the nature of the thermo-chemical operations involved, the manufacture of water gas and producer gas alternately is the same as that of water gas and producer gas mixed; and the presence of incombustible gases is just as much a disadvantage, from an economical point of view, in one process as it is in the other. Mr. Ross admits that a greater intensity of heat can be obtained from the combustion of water gas alone, and that therefore a smaller bulk of the gas and air will serve to produce the requisite amount of heat in any particular case; but he holds that "as regards the ultimate production of heat per pound of coal consumed, the water gas system is no better than an ordinary gas producer." This remark, of course, applies only to gas burnt for fuel, and has no reference whatever to the conversion of water gas into an illuminant by the addition of carburetting liquids.

The Management of the Stockport Corporation Gas-Works.—Many of our readers, especially those in the Manchester district, will doubtless share our regret that a name which has for something like a quarter of a century been associated with the Stockport Gas-Works, will shortly cease to be connected with them. We notice that the Gas Committee of the Stockport Corporation are inviting applications for the post of Engineer and Manager, which will shortly be vacant through the resignation of Mr. James Jacques—a step which, we understand, has been rendered necessary in consequence of ill-health.

Institution of Civil Engineers.—At the ordinary meeting of this Institution on Tuesday last, M. Carnot, President of the French Republic, and the Right Hon. Lord Rayleigh, F.R.S., were elected honorary members. Among the associate members who have been transferred to the class of members is Mr. W. Santo Crimp, of the Engineer's Department of the London County Council. The monthly ballot resulted in the election of 4 members and 41 associate members; among the latter being Mr. F. C. Suggate, of Northampton. The meeting was adjourned at nine o'clock, when the President (Sir John Coode, K.C.M.G.) and Council held the first of the series of monthly receptions to which reference was made in the JOURNAL a few weeks ago.

Preventing Freezing in Gasholder Cups and Tanks.—In the JOURNAL last week, we referred to some of the troubles experienced by gas managers in keeping their plant going during the continuance of frosty weather such as that which has lately prevailed. Happily their difficulties have been lightened by a welcome change in the temperature and the appearance of sunshine; but an occasional shifting of the wind to the north serves to remind them that they are not yet "out of the wood." The thermometer may unexpectedly again register several degrees of frost; and then their former anxieties will return. It may therefore be opportune to direct attention to the appliance devised by Messrs. Samuel Cutler and Sons for preventing, by an ingenious application of steam, the formation of ice in the cups and tanks of gasholders, which is familiar to many of our readers from the descriptions which have appeared in the JOURNAL. It has been successfully applied this winter to the new three-lift holder at the Bethnal Green station of The Gaslight and Coke Company, as well as to an exposed three-lift holder at the Hanover station of the Imperial Continental Gas Association.

Death of Mr. W. Daley, of Dunedin.—We regret to learn that a cable message has reached England from New Zealand, announcing the death of Mr. William Daley, the Manager of the Dunedin Suburban Gas Company's works. Mr. Daley was a man of large experience in the erection and management of gas-works; having been for many years in the service of Mr. G. Bower, of St. Neots, by whom he was engaged on important undertakings in many parts of the world. He put up the gas-works at Tver and the water-works at Voronege, in Russia; also the gas-works at Invercargil, in New Zealand. The latter he afterwards managed; but subsequently took the supervision of the Dunedin Company's works. This position he held when he died, much respected by his old employer and by his Directors. Mr. Daley, took great interest in the coal of New Zealand, which he asserted was, as an all-round gas coal, the best in the world. New Zealand, like the Mother Country and other of her colonies, has been suffering from labour troubles; and Dunedin, of course, came in for her share. Their effect on the gas undertakings of the colony generally, and his own in particular, was ably discussed in two reports, dealing with the general position of the Company at the close of June last, which were presented by Mr. Daley to his Directors in October, and noticed in our columns at the time. By the death of Mr. Daley, the gas engineering profession has lost a very useful member.

TECHNICAL RECORD.

THE INSTITUTION OF ELECTRICAL ENGINEERS.

Inaugural Address of Professor W. Crookes, F.R.S.

At the Opening Meeting for the present Session of the above-named Institution, which was held last Thursday, the PRESIDENT (Mr. William Crookes, F.R.S.) delivered his Inaugural Address for which he selected the interesting though somewhat abstruse subject of "Electricity *in transitu* from Plenum to Vacuum." The following is an abstract of the address.

In his introductory remarks, the President said he hoped he should not be considered out of order in venturing to call the attention of the members to purely an abstract phase of electrical science, seeing that he was addressing a society composed of electrical engineers as well as physicists; numberless instances showing that pure research is the abundant source from which spring endless streams of practical application. For instance, his own researches into high vacua had, to some extent, contributed to the present degree of perfection of the incandescent electric lamps. In the remarks he was about to make, he intended to treat electricity less as an end in itself than as a tool, by the judicious use of which some addition to the present scanty knowledge of the atoms and molecules of matter, and of the forms of energy which, by their mutual reactions, constitute the universe as it is manifest to the five senses. Explaining what he meant by the word "tool," Professor Crookes remarked that, when examining electrical reactions in high vacua, various rare chemical elements become in turn tests for recognizing the intensity and character of electrical energy. Positive and negative electricity effect respectively different movements and luminosities; hence the behaviour of the substances upon which electricity acts may indicate with which of these two kinds one has to deal. In other physical researches both electricity and chemistry come into play simply as means of exploration. In submitting certain researches in which electricity is used as a tool, or as a means of bringing within scope of the senses phenomena that would otherwise be unrevealed, the President recalled to the minds of his audience the now generally accepted theory of the constitution of matter. Refraining from speculating as to the constitution of liquid and solid matter, he proceeded to consider it in its gaseous state. He explained that the kinetic theory of gases teaches that the constituent molecules dart in every possible direction with great but continually varying velocities, coming almost ceaselessly into mutual collision. The distance that each separate molecule traverses without hitting another molecule is known as its "free path." The average distance traversed without collision by the whole number of molecules of a gas at any given pressure and temperature is called the "mean free path." The molecules exert pressure in all directions, and are only restrained by gravitation from dissipating themselves into space. In ordinary gases, the length of the mean free path of the molecules is exceedingly small compared with the dimensions of the vessel; and the properties then observed are such as constitute the ordinary gaseous state of matter, which depend upon constant collisions. But if the number of molecules in a given extent of space is greatly reduced, the free path of the molecules under electric impulse is so long that the number of their mutual collisions in any given time, in comparison with the number of times they fail to collide, may be disregarded. Hence, the average molecule can carry out its own motions without interference. When the mean free path becomes comparable to the dimensions of the containing vessel, the attributes which constitute gaseity shrink to a minimum, the matter attains the ultra-gaseous or "radiant" state, and a condition is reached where molecular motions under electrical impulse can easily be studied. The mean free path of the molecules of a gas increases so rapidly with progressive exhaustion that, while that of the molecules of air at the ordinary pressure is only 1-10,000th of a millimetre, at an exhaustion of 1-100,000,000th of an atmosphere—a point corresponding to the rarefaction of the air 90 miles above the earth's surface—the mean free path will be about 30 feet; while at 200 miles above the earth it will be 10,000,000 miles, and millions of miles out in the depths of space it will become practically infinite. In discussing the motions of molecules, it is necessary to distinguish the free path from the mean free path. Nothing is yet known of the absolute length of the free path nor of the absolute velocity of a molecule. For anything that can be proved to the contrary, these values may vary almost from zero to infinity. It is only possible to deal with the mean free path and the mean velocity.

The President then passed on to deal with the passage of electricity through rarefied gases; illustrating his remarks by means of three exactly similar bulbs; the electrodes being aluminium balls, and the internal pressures 75 mm., 2 mm., and 0·1 mm. respectively. The passing of an induction current through the bulbs in succession resulted in the production in each case of very different phenomena. In a slightly exhausted tube, the induction spark passed from one end to the other; and the luminous discharge was seen as a line of light acting as a flexible conductor. Under the action of an electro-magnet, the line dipped in the centre towards the poles of the magnet; but on reversing the current, the line curved upwards. In a highly exhausted tube the action was quite different—the line dipping under the action of the magnet, but not recovering itself. When the gas is rarer than is necessary to give the flexible line of light, the luminosity is discontinuous, or "stratified." After the stratification stage is passed, a very curious phenomena, called the "dark space"—a break in the continuity of the luminous discharge, separating the glow of the positive electrode from that of the negative—is produced. The radius of the dark space varies with the degree of exhaustion, with the kind of gas in which it has been produced, with the temperature of the negative pole, and to a less extent with the intensity of the spark. Wishing to learn something of the electrical condition of the matter within and without the dark space, Professor Crookes made an exploration with idle poles, the results of which he described. He found that, when a substance that will phosphoresce under electrical excitement is introduced into a tube, furnished with the usual poles at the ends, the position of greatest luminosity is found to be at the border of the dark space, just where the two opposing armies of negative and positive atoms "meet in battle array" and re-combine.

The subject of radiant matter was next dealt with. The President showed that a stream of ultra-gaseous particles does not carry a current of electricity, but consists of a succession of negatively electrified molecules whose electrostatic repulsion overbalances their electro-magnetic attraction, probably because their speed is less than the velocity of light. With regard to the properties of radiant matter, he remarked that one of its most characteristic attributes—that, in fact, which gave it its name—is that it moves in approximately straight lines, and in a direction almost normal to the surface of the electrode. If an induction current is kept passing continuously through a vacuum tube in the same direction, it is possible to imagine two ways in which the action proceeds. Either the supply of gaseous molecules at the surface of the negative pole must run short, and the phenomena come to an end, or the molecules must find some means of getting back. Professor Crookes showed an experiment which revealed the molecules in the very act of returning. He took a tube, exhausted to a pressure of 0·001 mm., in the middle of which was a thin glass diaphragm, pierced with two holes. At one part of the tube a concave pole was focussed on the upper hole in the diaphragm. Behind this upper hole, and in front of the lower one, were moveable vanes, capable of rotation by the slightest current of gas through the holes. On passing the current with the concave pole negative, the small vanes rotated in such a manner as to prove that, at this high exhaustion, a stream of molecules issued from the lower hole in the diaphragm, while at the same time a stream of freshly-charged molecules was forced by the negative pole through the upper hole. The experiment clearly showed that his theory was right. This view of the ultra-gaseous state of matter was, he said, advanced merely as a working hypothesis, which, in the present state of knowledge, might be regarded as a necessary help to be retained only so long as it proved useful. In experimental research, early hypotheses had necessarily to be modified or adjusted, or perhaps entirely abandoned, in deference to more accurate observations. As Dumas had truly said, hypotheses were like crutches, which were thrown away when one was able to walk without them. In connection with this subject, Professor Crookes replied to certain attacks made on the views he had propounded, and showed by further demonstration that he was justified in adhering to his original theory.

Phosphorescence in high vacua was next considered. The President remarked that he had already pointed out that the molecular motions rendered visible in a vacuum tube are not the motions of molecules under ordinary condition, but are compounded of these ordinary or kinetic motions and the extra motion due to the electrical impetus. Experiments showed that in such tubes a few molecules might traverse more than a hundred times the mean free path, with a correspondingly increased velocity, until they were arrested by collisions. Indeed, the molecular free path might vary in one and the same tube, and at one and the same degree of exhaustion. Very many bodies—such as ruby, diamond, emerald, alumina, yttria, samaria, and a large class of earthy oxides and sulphides—phosphoresce in vacuum tubes when placed in the path of the stream of electrified molecules proceeding from the negative pole. The composition of the gaseous residue present does not affect phosphorescence. The earth yttria phosphoresces well in the residual vacua of atmospheric air, of oxygen, nitrogen, carbonic anhydride, hydrogen, iodine, sulphur, and mercury. He added that he had spoken only of the phosphorescence of substances placed under the negative pole; but, from numerous experiments, he had found that bodies would phosphoresce in actual contact with that pole. This, however, was only a temporary phenomenon, and ceased entirely when the exhaustion was pushed to a very high point. A question which had exercised his mind for some years was: What occasions phosphorescence? So far as he had gone, he found that phosphorescence was an attribute of non-conductors only.

Having discussed the electrolytic hypothesis of the passage of electricity through rarefied gases, the President proceeded to apply it with the gaseous residue of a diatomic gas (hydrogen) and with the vapour of mercury—a monatomic gas. To show how intimately chemistry and electricity interlock, he remarked, at the close of this portion of his address, that one of the latest

theories in chemistry rendered a division of the molecule into groups of electro-positive and electro-negative atoms necessary for a consistent explanation of the genesis of the elements. This, he said, was so important that he asked to be excused for digressing a little into this development of theoretical chemistry. He then proceeded as follows: It is now generally acknowledged that there are several ranks in the elemental hierarchy, and that besides the well-defined groups of chemical elements there are underlying sub-groups. To these sub-groups has been given the name of meta-elements. The original genesis of atoms assumes the action of two forms of energy working in time and space—one operating uniformly in accordance with a continuous fall of temperature, and the other having periodic cycles of ebb and swell, and intimately connected with the energy of electricity. The centre of this creative force, in its journey through space, scattered seeds or sub-atoms that ultimately coalesced into the groupings known as chemical elements. At this genetic stage, the new-born particles, vibrating in all directions and with all velocities, the faster-moving ones would still overtake the laggards, the slower would obstruct the quicker, and we should have groups formed in different parts of space. The constituents of each group whose form of energy governing atomic weight was not in accord with the mean rate of the bulk of the components of that group, would work to the outside, and be thrown off to find other groups with which they were more in harmony. In time a condition of stability would be established, and we should have our present series of chemical elements, each with a definite atomic weight—definite on account of its being the average weight of an enormous number of sub-atoms or meta-elements, each very near to the mean. The atomic weight of mercury, for instance, is called 200; but the atom of mercury, as we know it, is assumed to be made up of an enormous number of sub-atoms, each of which may vary slightly round the mean number 200 as a centre. We are sometimes asked why, if the elements have been evolved, we never see one of them transformed, or in process of transformation, into another. The question is as futile as the cavil that in the organic world we never see a horse metamorphosed into a cow. Before the copper can be transmuted into gold, it would have to be carried back to a simpler and more primitive state of matter, and then, so to speak, shunted on to the track which leads to gold. This atomic scheme postulates a to-and-fro motion of a form of energy governing the electrical state of the atom. It is found that those elements generated as they approach the central position are electro-positive, and those on the retreat from this position are electro-negative. Moreover, the degree of positiveness or negativeness depends on the distance of the element from the central line. Hence, calling the atom in the mean position electrically neutral, those sub-atoms which are on one side of the mean will be charged with positive electricity, and those on the other side of the mean position will be charged with negative electricity—the whole atom being neutral. This is not a mere hypothesis, but may take the rank of a theory. It has been experimentally verified as far as is possible with so baffling an enigma. Long-continued research in the laboratory has shown that, in the matter which has responded to every test of an element, there are minute shades of difference, which have admitted of selection and resolution into meta-elements, having exactly the properties required by theory.

In bringing his address to a close, Professor Crookes frankly admitted that he had by no means exhausted the subject. He had struggled with problems which must be conquered before one could arrive at exact conclusions, which, so far as inorganic Nature was concerned, could only be reached by the harmonious interfusion—not confusion—of the present twin sciences, electricity and chemistry. Of this interfusion he had endeavoured to give his hearers a foretaste. In elaborating the higher physics, the study of electrical phenomena must take a large—perhaps the largest—share. Regions once unknown had been invaded; but a formidable amount of hard work remained to be completed. As they proceeded, they might look to electricity not only to aid, as it already did, the sense of hearing, but to sharpen and develop other powers of perception. Science had emerged from its childish days, and had shed many illusions and impostures. It had discarded magic, alchemy, and astrology; and certain *pseudo*-applications of electricity with which the present Institution was little concerned, had, in their turn, passed into oblivion. There was no occasion to be disheartened at the apparent slow pace of elemental discovery. The desponding declared that if Roger Bacon would re-visit "the glimpses of the moon," he would shake his head to think we were still in a haze as to the evolution of atoms. For himself he held the firm conviction that unflagging research would be rewarded by an insight into natural mysteries such as now could scarcely be conceived. Difficulties, said a keen old statesman, were things to be overcome; and, to his (the President's) mind, Science should disdain the notion of Finality. There was no stopping half way; and we were resistlessly driven to ceaseless inquiry by the spirit "that impels all thinking things, all objects of all thoughts, and rolls through all things."

Mr. Marshall, the Manager of the Pontefract Corporation Water-Works, recently sent in his resignation; and at the meeting of the Council last Thursday week, it was formally accepted.

GAS ASSOCIATIONS AND THEIR MUTUAL RELATIONS.

By C. J. Russell Humphreys, Secretary of the American Gaslight Association.

[A Paper read before the Society of Gas Lighting, New York.]

That the number of gas engineering societies has increased largely both in America and abroad during the last few years is a statement that hardly needs to be proved by evidence, for anyone conversant with the gas literature of the day will accept it as a fact; and it very naturally raises the question whether this augmentation of technical societies increases or decreases the value of the older organizations. Generally, perhaps, it may be said that the starting of a new society cannot decrease the value of those already in existence, unless its territory is carved out of the field of an established organization. Particularly would this hold true in a country of "magnificent distances" like America, where obviously a society formed—to take an extreme case—on the Pacific Slope would not interfere with the New England Association of Gas Engineers. On the other hand, where a new society must seek its support from a territory which is included in the area covered by an existing Association, then, I think, the effect of the former on the latter will be dependent on circumstances. Doubtless the members of the newer and smaller Associations would transfer a large part of their interest from the older to the newer society; and while they might not withdraw entirely from the larger body, their contributions to the literary programme of the latter would probably decrease by reason of the creation of the newer organization in their particular territory, when, in such a case, the value of the older and larger Association would be decreased by the formation of the newer society within its borders, unless means were taken to counteract this effect, or, rather, unless the two societies were worked together in such a way as to add to the efficiency of the larger body. With these general thoughts in mind, let us glance for a moment at the various Gas Engineering Associations now in existence in America, and their effect one on the other; and then endeavour to ascertain whether the value of each and all could be improved by working in closer compact one with the other.

First, we have the American Gaslight Association—as comprehensive as its name, entitled to draw its support from the entire American continent; and, as a matter of fact, having on its roll of membership gas engineers from Canada on the north to Texas on the south, and from the Atlantic to the Pacific coast. The Western Gas Association draws its support from the Western States. The South-Western, from the States of the region indicated by its title. The Ohio Gaslight Association gathers together the gas men from the State from which it takes its name. Whether or not the Central New York Gas Association and the Gas Engineers' Association of Pennsylvania are still alive, I cannot say. I believe an attempt was made to evolve a society in Connecticut; but whether or not it really had an existence I am not sure. The (New York) Society of Gas Lighting and the (Boston) Guild of Gas Managers represent the smaller, numerically, of such organizations.

That there is room for all these societies, there can be no question; for each performs work which the other organizations could not do, and fills requirements which would be unfilled did not each Association exist. Thus it is clear that to no other organization could we turn if the Society of Gas Lighting ceased to exist, and have our wants supplied as they are now; none of the other organizations could take the place of this Society. Many gas men, managers of smaller gas-works of New England, attend the meetings of the Association which takes its name from that section of the country, who do not attend the American Gaslight Association, and would not if the smaller society ceased to exist; and the same remark would hold true if transferred to the other districts of the country and their Associations. On the other hand, it is also true that these District Associations do interfere with the usefulness of the American Gaslight Association. In evidence of the truthfulness of this statement, I would say that frequently, when, in my office of Secretary of that Society, I have been endeavouring to secure writers of papers for our fall meetings, I have met with this response: "No; I cannot write anything for the American Association, because I have to prepare an essay for the meeting of the Western Association. I cannot write two papers in one year; and I feel my first duty is to the home organization." An answer similar in substance to this I have frequently received. Substitute for the Western Association the name of the New England Society, and you could double the number of times I have received this reply. I doubt not the energetic Secretary of the Western Association has received a similar response many times, only that the name of the Ohio Association stands in place of the Western, and the Western in lieu of the American. That is, a member of both the Ohio and the Western Associations will place his duty to the former ahead of the latter, while both will take precedence to the American Association. Consequently, every year increases the difficulty of obtaining papers; and it might also be said that the standard of the dissertations is kept up better in the smaller societies than in the larger ones. Thus, as I stated a moment ago, the District Associations are interfering with the usefulness of the American Association; and the smaller district societies work against the larger one in its particular neighbourhood. That the balance is on the right side—that the good they do outweighs the harm—I am quite

ready to admit. But having said this, I am not content to leave well enough alone. I am not satisfied that we should be content to drift along whithersoever the current takes us, resting at ease, because I know the general cause is, in the main, being advanced; for I cannot but feel that, were all to work together, we could all advance more rapidly, and the lead secured by one would not be at the expense of another.

What I ask for is more systematic and more united action on the part of all the Gas Associations. I would wish to see each society appoint from among its members a Committee which could be christened as its sponsors wished, but which might perhaps bear the name of the "Committee on Papers and Research." In order that I might more easily explain the duties of these imaginary Committees, let us assume that each organization has a Committee of this character. Say the Research Committee of the American Gaslight Association has had submitted to it some knotty question—shall we say "Naphthalene"?—with instructions to secure all the information thereon, and to report in print to the Association, with power to draw on the treasury for their expenses. I do not wish to forestall the wisdom of such a Committee, but it would seem to me that, if such a question were submitted, it would naturally divide itself into two parts—scientific and practical. Under the first head, the Committee would secure the services of a scientific expert to tell them all he could on the chemistry of the subject; and, in order that he might better aid the Committee, he would be called upon to assist them in the practical investigation. The second part of the investigation would be conducted by securing the help of certain members of the American Association to co-operate in the work, by making observations during the year in regard to this subject.

The Committee would first prepare a set of questions covering the details of the arrangement of the manufacturing plant, and each of the members assisting would be asked at the outset to answer these queries. Then the Committee would prepare a definite plan of observations, which each of the members would be asked to have made; and blanks would be provided on which they could make their report to the Committee monthly. I do not believe it would be necessary to frame the questions in such a way, or to ask such a multitude of questions, as to put the members to any great trouble. A transcript of the register of the temperature of the gas at different stages of the process of manufacture, a statement as to the state of the weather of each day—these are matters of record by almost all gas companies; and it would give but little trouble to transcribe them for the Committee. If a further request were made of a member to ascertain the nature of the soil surrounding the services where he was particularly troubled with this deposit, and to ascertain its temperature at such points, this would scarcely be considered a hardship.

I would, however, go a step farther; and this will explain what I mean by united action on the part of different societies. I would have this Research Committee call to their aid the like Committees of the other Associations, who would secure from their members a certain number who would assist in making the same observations; blanks being furnished for this purpose by the Committee of the American Association. The Committee of the District Associations would collect these returns; and, after taking a copy of them, and making such deductions therefrom as they might deem warranted, pass the returns on to the Committee of the American Association. That information of sufficient value to pay for this trouble would be thus secured, I am inclined to believe.

But, it might be asked, Why this unnecessary machinery? Why not have the Committee of the American Association apply direct to these parties, instead of working through the District Associations? First, because many of the persons whose co-operation would be sought are not members of the American Association, and would not be likely to take this trouble for a society of which they were not members. Secondly, because the Committee of the District Associations would be better acquainted with the *personnel* of their members, and could thus better designate whom to call upon for assistance. Thirdly, because the comments on, and deductions from the returns made by the District Committees would be valuable. For instance, it might be justly said that a Committee of the Ohio Association, being well acquainted with the conditions prevailing throughout that State, could make such a commentary on the returns as would greatly assist the Central Committee in their work.

Let us now assume another case. Let us suppose that the Western Association desired some information on "Carbonization," and that their Research Committee, after consideration, divided up the subject under the following heads: "The Proper Duration of a Charge for Different Qualities of Coal;" "The Amount of Heat Practically required in the Carbonization of a Ton of Coal;" "The Amount of Heat required Theoretically in the Carbonization of a Ton of Coal." Many other and more pertinent divisions of the question could be made; but these are mentioned because they occur to me off-hand. They will serve to illustrate my point, and will therefore answer my present purpose. Now, it is, of course, true that the Western Association could find from their own members a sufficient number of men to take up these several questions, and write papers upon them; but if all these subjects, and perhaps many more subdivisions of the one general subject, were to be brought up and discussed at one meeting of the Association, the meeting would have a certain sameness.

My plan would be that the Research Committee would in such a case call on the like Committees of the other societies, and that each Committee should take one division of the subject, and designate one or more of the members of the Association to make experiments on that branch of the question, and embody the results of the investigation in a paper to be read at the next meeting of the Association. Thus, the question of "Carbonization" would be under consideration through the year by all the Associations, and would be discussed by the representatives of all sections of the country. If one of the Associations desired information on some of the disputed points of water-gas engineering, substitute for the headings such titles as these: "Deep *versus* Shallow Fuel Beds in the Generator;" "The Proper Duration of a Run;" "Heavy Oils *versus* Light Naphthas;" "The Proper Relation in Area between Fixing Chamber and Generator." Commit these several subdivisions of the question to the different Associations, and you get the same result. In a word, I would advocate having the different Associations discuss at least one subject in common through the year, and do it systematically. I would go a step farther. I would have formed from the Research Committee an Executive Committee, made up of at least one member from each Committee. This Executive Committee would meet once or twice a year, and designate three or four of the general subjects which would be considered during the year by all the Associations, decide how these subjects should be subdivided, and designate which Association should take each subdivision. The Research Committee of each Association would then designate what members should write on, or investigate the special subjects thus committed to that particular Association. We should thus have at least three subjects which would be considered by all the Associations. And if we were to have all the papers read in response to this action of the Executive Committee, together with the discussions thereon, printed in leaflet style, of uniform size and type, we would have at the end of the year some very valuable papers in a readily accessible form.

If objection is raised to this scheme on the score of expense, I would say that travelling expenses and printing, with some clerical help, would represent the main outlay, unless some abstruse question, requiring the employing of experts, were taken up; and, surely, there would be no difficulty in meeting these incidental expenses. I think it would be well to try the scheme in this tentative way first—namely, in relation to the writing of papers alone. If the scheme worked well, and it was desired to submit to the Committee some subject for extended research, requiring the aid of expert chemists, I think it would not be difficult to raise the small amount of money thus required.

But it may be asked, as the Society of Gas Lighting is of a different constitution from any of the other societies, and could not work fully with the other Associations in all points, why do I bring the matter up here instead of at one of these more general Associations? Simply because most of the members present are members, and, in some cases, officers, of the other organizations; and therefore, if the scheme, modified as in your wisdom may be deemed expedient, should receive your endorsement, it would be sure of earnest advocates at the various meetings of the different Associations, and would be well launched on the way to an early trial, which would mean, I think, the beginning of a plan whereby the usefulness of the various Gas Engineering Associations would be considerably enhanced, to the great benefit of the industry in which we all are so much interested.

The Bradford Water-Works Engineership.—The minutes presented by the Water Committee at last Tuesday's meeting of the Bradford Town Council included a resolution to confirm the appointment of Mr. James Watson, M. Inst. C.E., of Dundee, as Engineer of the Corporation water-works, at a salary of £1000 per annum. It was mentioned that Mr. Watson was to devote the whole of his time to the service of the Corporation. The minutes were unanimously adopted.

The Shipment of American Petroleum to Europe.—The Standard Oil Company have now control, it is reported, of most of the tank steamers carrying petroleum from the United States to Europe. With the recent purchases, the Company's fleet includes 21 steamers of this class, having a total capacity of 24,435,000 gallons, or enough, it is claimed, to carry in 20 trips the entire year's exports. The carrying capacities of the vessels range from 1,400,000 down to 900,000 gallons. Besides this Company's tank steamers, there are afloat 32 others, all ocean-going boats, a large number of which are employed in carrying American petroleum.

Mr. J. Chamberlain, M. Inst. M.E., having severed his connection with the Brunswick Gas Company, of Melbourne, Victoria, has accepted an engagement to superintend the construction of a gasholder tank for the Charters Towers Gas Company, North Queensland, and to advise the Company generally on the extension and re-modelling of their plant; the consumption of gas having overtaken the storeage capacity of the works. The tank, when finished, will be 61 ft. 6 in. in diameter and 16 ft. deep; and the holder (constructed by Messrs. C. and W. Walker, and supplied through Mr. W. W. Monk, their Australasian agent in Melbourne) will be 60 feet in diameter and 16 feet deep—equal to a storeage of 45,000 cubic feet.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

The Inquiry-Circular Nuisance Again.

SIR,—After your condemnation of the practice of issuing circulars by red-tape Jacks-in-office, asking for information on matters that every tyro worth his salt should know, there has been a considerable diminution in this class of nuisance. One, however, has just been issued from a Midland centre well worthy of your attention, since, for unblushing impertinence, it surpasses anything recently to hand. A specimen query is as follows: "Which three stoves do you find most in demand? Name of maker. Number of stove." As an unmitigated nuisance, the circular-letter can only be classed as next in order to the begging-letter, which is so seasonable at this period of the year.

Jan. 15, 1891. ANTI-JACK.

LEGAL INTELLIGENCE.

PLYMOUTH ADJOURNED QUARTER SESSIONS—Friday, Jan. 9.

(*Before Mr.* H. M. BOMPAS, Q.C., *Recorder.*)

A Question as to the Legality of Strikes.

In November last, the Secretaries of three Trades Unions having ranches in Plymouth—Messrs. Curran, Matthews, and Shepheard—were convicted by the Borough Magistrates for intimidating Mr. G. F. Treleaven, a coal merchant, and fined £20 each and costs. An appeal from this decision was made to the Recorder, who was occupied for two days in hearing it; and the result was that the convictions were sustained. This has caused so much surprise in Trade Union circles, that the opinion of a Superior Court is to be asked on the case; and as the Council of the Gas Workers' Union, supported by the London Trades Council, are already moving in the matter, and, moreover, as the point at issue involves an important question as to the legality of strikes, we give a full report of the Recorder's judgment, in which the facts of the case are fully set forth.

Mr. THOMPSON and Mr. THORNE appeared for the appellants; Mr. POLAND, Q.C., and Mr. DUKE for the respondent.

The RECORDER, before giving his decision, made a few preliminary observations. He remarked, first, that he had not to decide what the law ought to be, but what it is. If it was thought to bear hardly upon trades unions or the public, it was for Parliament to find the remedy, not for him to strain the law to accomplish objects which might seem to be desirable. Then he thought it was desirable that he should, as Recorder of the borough, lay down what he considered to be the true effect of the statute in respect of which the appeal was brought, so that employers and employed might alike understand their rights and duties, even though this might not be absolutely necessary for the decision of the case. He then proceeded as follows: The prosecutor (Mr. Treleaven) is a coal merchant, and in the course of his business has to provide for the unloading of ships he has chartered. At the time of the acts out of which these proceedings arose, he was unloading four ships, each with a gang of four men. Three of these gangs consisted of men who were members of one or other of the Trade Unions to be hereafter mentioned. The other consisted of men who were not connected with any Union; and they were unloading a vessel called the *Ocean Queen*. The defendants are the Secretaries of the three Trades Unions that have branches in this town—viz., the National Union of Gas Workers and General Labourers of Great Britain and Ireland, the Dock, Wharf, Riverside, and General Labourers' Union of Great Britain and Ireland, and the Bristol, West of England, and South Wales Operatives' Trade and Provident Society, each of which is registered under the Trades Union Act of 1871. The defendants appear to have acted throughout in accordance with the wishes and directions of those Unions. The Unions consider it desirable that all the labourers in the port should belong to one or other of their organizations; believing that if they can obtain a monopoly of the labour, they would be able to raise the price of it—that is, increase the rate of wages. This appears from the statement of Mr. Curran to the reporter of the *Western Daily Mercury* on the 16th of October. Although monopolies are not favoured by the Common Law, there is nothing illegal in this if it can be brought about by legal means. It appears to me that it would be similar to combinations among capitalists such as that of the owners of salt-works in Cheshire, who have combined to form a Union which, having a monopoly of Cheshire salt, is able to raise its price and increase their profits. I may say at once that I further believe that the defendants acted *bond fide* with a desire to benefit their fellow-workmen, and not from a wish to preserve or increase their own payments, as was suggested by Mr. Poland. I also think that they desired and intended in all they did to keep within the law, even though they may have in fact failed to do so. I equally accept Mr. Treleaven's statement that he has acted throughout from a *bond fide* desire to secure freedom of trade, and not from any hostility to Trades Unions; nor do I think there is any foundation for the adverse remarks of Mr. Thompson with respect to his calling in reporters at the interviews with the defendents. I think that in doing so he only acted as a prudent man, in a matter out of which serious questions were likely subsequently to arise, and in which he was dealing not with his own workmen, but with the officers of their important organizations. He seems to me to have acted throughout with judgment and good feeling. At the first interview which took place between Mr. Treleaven and the defendants, no decision was come to; but the defendants stated openly that if Mr. Treleaven would not agree to discharge the non-Union men, and employ for the future only Union men, they would endeavour to compel him to do so by calling out the members of their Union then working for him, and prevent members of the Union from working for him for the future, and thus render it difficult or even impossible for him to carry on his business. Mr. Treleaven took time to consider what course he should pursue, and on the 14th of October he decided not to yield, and gave the four non-Union men a fresh engagement to unload another ship—the *Canada;* and on the 15th they began to unload it. This resolution was communicated to the defendants at the interview of the 14th. On the morning of the 14th there was a joint meeting of the Unions, at which it was resolved to adopt the course which the defendants had stated at their interview would be adopted; and accordingly on the 15th the defendants, in the presence of Mr. Treleaven, whom they had asked to hear it, made the following statement to his workmen and others who were assembled on the wharf: "Inasmuch as Mr. Treleaven still insists on employing non-Union men, we, your officials, call upon all Union men to leave their work, use no violence, use no immoderate language, but quietly cease to work and go home." The orders thus given were obeyed; and the Union men who were unloading Mr. Treleaven's ships immediately ceased unloading them, although they had not completed the work that they were under contract to perform. The question for my decision in this case is whether, in thus acting, the three defendants were guilty of a breach of the 7th section of the Conspiracy and Protection of Property Act, 1875 (28 & 29 Vict., cap. 86). If they were so, the fact that they did not rightly interpret that Act is no defence, though it may affect the question of the punishment to be awarded. Ignorance of the law excuses no one. Upon the above facts of the evidence, I am of opinion—

1. That Mr. Treleaven was afraid of injury to his trade through the course which the defendants stated the Unions would pursue; and that he had reasonable grounds for that fear which would have influenced any man of ordinary sound views.

2. That the defendants invited him to listen to what they said because they intended to cause this fear, and with the view of inducing him in consequence to discharge the non-Union men who were working for him.

3. That the direct object of the defendants in calling out the men was to injure the business of Mr. Treleaven, and not because of anything in the terms of employment of the men to which the defendants or the men themselves objected.

4. That the Union men, in leaving their employment at the request of defendants, were, as defendants knew, breaking their contracts.

5. That the defendants did not desire or intend that any personal violence should be used, or injury done to Mr. Treleaven or his property; that it was not proved that their words or acts were likely directly to cause any such violence or injury, although I am of opinion that Mr. Treleaven was not unreasonably afraid that such violence or injury might occur from the action of the members of the Union, but in consequence of the strike against the wishes and the intentions of the defendants.

6. That the defendants had no ill-will against Mr. Treleaven personally, but acted with the object of obliging all the labourers to join the Union as a means of selling employment and obtaining for the members a monopoly of the labour of the port, as I have described.

I proceed now to consider the meaning of the statute under which these proceedings were taken, and to which these facts have to be applied; and it may be desirable for me to refer to the earlier legislation. The first Act I need notice is that of 6 Geo. IV., cap. 129, which repealed most of the earlier Acts relating to workmen, and by section 3 provided: "If any person shall by violence to the person or property, or by threats or intimidation, or by molesting or in any way obstructing another from, or endeavouring to force any journeyman, manufacturer, workman, or other person hired or employed in any manufactories, trade, or business, to depart from his hiring, employment, or work, shall be imprisoned for any term not exceeding three months." The section is a long one, forbidding, under different heads, interference, in the ways named, with the course of business. By sections 4 and 5 of the Act, meetings of employers or workmen to fix the rate of wages or the hours of employment were made lawful. Upon this section many cases were decided; and it was held "that there need not be a threat of violence—there need not be a threat to do an illegal act," as per Blackburn judgment in the case of *O'Neil v. Longman.* The case of *Skinner v. Kitch*—one of the latest cases under the Act—is as follows: The respondent, a master, had in his employ several carpenters, who were members of a Carpenters' Union, and also one who was not a member. The appellant, who was a secretary of a branch Union, served the respondent with the following notice in the middle of a week: "I am requested by the Committee of Carpenters to give the men in your employ notice to come out on strike, unless he becomes a member of the Society. The motion will be carried out after the end of this week, unless settled according to the Society's laws." It was held that the appellant was rightly convicted under 6 Geo. IV., cap. 129, of having, by threats, endeavoured to force the respondent to limit the description of his workmen. In the year 1871 this Act was repealed by 34 & 35 Vict., cap. 32, which provided by section 1:

> Every person who shall do any one or more of these following acts, that is to say—(1) use violence to any person or any property; (2) threaten or intimidate any person in such manner as would justify a Justice of the Peace, on complaint made to him, to bind over the person so threatening or intimidating to keep the peace; (3) molest or obstruct any persons in manner defined by this section with a view to coerce such person, one being a master, to dismiss or cease to employ any workman . . . . shall be liable to imprisonment, with or without hard labour, for a term not exceeding three months: Provided that no persons shall be liable to any punishment for doing or conspiring to do any act on the ground that such act restrains or tends to restrain the free course of trade, unless such act is one of the acts hereinbefore specified in this section, and is done with the object of coercing, as before mentioned.

I omit the parts of the section immaterial to the present case. The effect of the section was to limit the threats and intimidation which would render a man criminally liable to threats of personal violence, since it is only in the case of such threats that the person using them can be bound over to keep the peace. In the year 1875 this Act was repealed, and the present Act (38 & 39 Vict., cap. 86) passed. By this Act it was provided that an agreement or combination by two or more persons to do or promise to do any act in contemplation or furtherance of a trade dispute between employers

and workmen shall not be indictable as a criminal conspiracy if such act committed by one person would not be punishable as a crime. Section 7, under which the proceedings were taken, is as follows:—

Every person who, with a view to compel any other person to abstain from doing or to do any act which such other person has a legal right to do or abstain from doing, wrongfully, andwithout legal authority, uses violence or intimidates such other person or his wife or children, or injures his property, or persistently follows such other person about from place to place, or hides any tools, clothes, or other property owned or used by such other person, or deprives him of, or hinders him in the use thereof, or watches or besets the house or other place where such other person resides, works, carries on business, or happens to be, or the approach to such house or place, or follows such other person with two or more other persons in a disorderly manner in or through any street or road, shall, on conviction thereof by a court of summary jurisdiction, or on indictment as hereinafter mentioned, be liable either to pay a penalty not exceeding £20, or to be imprisoned for a term not exceeding three months with or without hard labour. Attending at or near the house or place where a person resides, or works, or carries on business, or happens to be, or the approach to such house or place, in order merely to obtain or communicate information, shall not be deemed a watching or besetting within the meaning of this section.

There are three phrases in this section which it is necessary to consider: (1) "Any act which such other person has a legal right to do or abstain from doing;" (2) "wrongfully and without legal authority;" (3) "uses violence or intimidates." As to the first, the section only applies where the object of the intimidation is to compel the person intimidated to abstain from doing or to do what he has a legal right to do or abstain from doing. It does not, therefore, apply to pressure brought to bear upon an employer by a strike on any dispute between such employer and his workmen as to the rates of wages or the terms of their employment. An employer has no "legal right" to employ a workman otherwise than according to that workman's consent; and though in one sense it may be said that an employer has a legal right to abstain from giving a workman higher wages, he has only a legal right to abstain from doing so if he ceases to employ the workmen altogether; and that is a choice which a strike for higher wages leaves open to him. In the present case, however, the object of the intimidation, if any, was to prevent the prosecutor continuing to employ certain workmen upon terms to which they were willing to agree; and this he had clearly a legal right to do. I must not, of course, be understood as implying that the section would not apply to acts of intimidation directed against particular workmen or other persons during the course of a strike respecting wages or the other terms of employment; but only that such a strike is not, for the reasons I have given, in itself illegal under the section. As to the second phrase, the act of intimidation must be done "wrongfully and without legal authority." These words are new. In the previous statute, it was only provided that the act must have been done with a view to coerce. It must be observed that in the present Act the section is general, and does not, as in the former statute, apply only to disputes between employers and workmen; and it is probably on this ground that these words have been inserted. Thus the latter phrase would apply to a policeman arresting a man suspected of crime; and the words may have been deemed necessary to prevent the section applying to ordinary cases of trade competition. Two views may, I think, be taken of the word "wrongfully." It may mean that the acts subsequently mentioned shall only be punishable when illegal apart from the statute; or it may mean that the acts, though *primâ facie* punishable, shall not be so if done in the exercise of some right, or under some legal authority, as in the case of injury to trade done or threatened by competition in the exercise of the concurrent right of the person so acting to trade. The fact that one of the acts mentioned in the section is persistently following a person from place to place, which can hardly be itself illegal, seems to point to the latter being the true interpretation; but I do not think it necessary to decide it for the purposes of this case. As to the third phrase, the most important question is: What is the meaning of the word "intimidation"? The fact that the words of the former Act, limiting it to cases in which the persons might be bound over to keep the peace, are omitted, appears to me to point to the word being employed in the larger sense in which it was used in the earlier Act of 6 Geo. IV., cap. 129. It is true that it is placed between the words "uses violence" and the words "injures his property," instead of after the latter, as was the case in the preceding statutes; but I think this is explained by the fact that the words are applicable only to persons, and are, therefore, most suitably linked with the words "uses violence." I see no reason, therefore, to give to the word any other than its usual meaning different to that which it had in the earlier Act—6 Geo. IV., cap. 129. Mr. Thompson has called my attention to a report of the trial before Mr. Justice Cave at Liverpool, of a man named M'Kevitt, in which that learned Judge directed the jury that in this section "intimidation" meant only using violence or threatening a man with violence. The case of *Judge v. Bennett* (52 J.P., 247), which was the decision of a Divisional Court consisting of Justices Stephen and A. L. Smith, the point was expressly raised whether the word "intimidation" must be construed as *ejusdum generis* with violence; and the Court held that this was not the true construction, but that the word included any kind of threat, provided it made the person against whom it was used reasonably afraid. I think I am bound by that case, with which, moreover, I agree, for the reasons I have stated; and I must hold that the fact that the defendants did not threaten or intend to use personal violence does not prevent their conduct, if it amounted to intimidation in the ordinary sense of the word, being a breach of the section. But a further question arises—whether intimidation (at any rate, in order to be wrongful intimidation) does not imply the doing or threatening to do something that is contrary to law. This was distinctly held with respect to threats under the Act of 6 Geo. IV., and seems to be implied in the judgment in the case of *Judge v. Bennett* above referred to. There is, no doubt, the distinction pointed out by Mr. Poland between "threats" and "intimidation"—that the former, unless limited to threats of illegal action, might include threats which had no effect upon the mind of the man to whom they were addressed. I am, however, of opinion that this is not a sufficient distinction to induce me to depart from the decisions on the former Act; and I must hold that wrongful intimidation is confined to the doing or threatening to do an illegal act. I am of opinion that the acts done or threatened, if illegal, need not be criminal apart from the statute. This, I think, appears from the judgment of Mr. Justice Blackburn in the case of *O'Neil v. Longman*. After saying that the threat must be to do an illegal act, he says: "There was no right, according to any rule of the club, to turn Longman out; and therefore it would be illegal to do so, though I dare say there was an unwritten understanding that they would turn any member out if he did not strike when they struck. If, indeed, they honestly thought they were a society which had a right to turn him out, perhaps saying they would do so might not amount to such a threat." I am of opinion, therefore, that the word "intimidation" in this section means any words or conduct which are intended to cause, or do reasonably cause, fear in another person, with the object mentioned in the section, provided the acts done or threatened are not such as the person doing them has a legal right to do. From the statement I have given of the facts in this case, it will be seen that I am of opinion that the defendants, by their words and acts, did intend to cause, and did reasonably cause, in the mind of the prosecutor, fear of serious injury to his trade, with a view to compel him to abstain from doing what he had a legal right to do. There remains, therefore, only the question whether the course of conduct which they threatened and partly carried out was such as they, or the Union which they represented, had a right to do. Now, it is hardly disputed that, in calling upon the Union men to come out before their contracts had expired, they were acting illegally. This was decided in the case of *Lumley v. Gage;* and I think upon this ground the conviction must be upheld. But if I rested my decision upon this alone, it would be of little service as a guide to the future conduct of the parties, since the defendants' objects would have been equally obtained by inducing the members of the Unions not to work for Mr. Treleaven in the future, after the unloading of the vessels in port had been completed. I proceed, therefore, to consider whether it would be illegal for the Unions to induce their members to refuse for the future to work for Mr. Treleaven with a view to prevent his business going on, and so compelling him to discharge the non-Union men who were working for him. I am of opinion that it would, and upon two grounds. First, the case of *Skinner v. Kitch*, and other cases before referred to, appear to me to show that such a combination would, before the present Act, have been a criminal combination; and the 3rd section of the Act, though it prevents any criminal proceedings from being taken in respect of such a combination, if made in furtherance of a trade dispute, does not, in my opinion, make it legal, so as to prevent it being the subject of criminal proceedings, or, if used for purposes of intimidation, being within the 7th section of the statute. I see no such difference between the terms of the present statute and those of 6 Geo. IV., cap. 129, as would justify me in refusing to follow those decisions, or in quashing the conviction in this case. But I am of opinion that, upon broader grounds, such conduct of the Unions would be illegal, as being an intentional injury of another man's trade without just cause or excuse. The question how far, and under what circumstances, a man has a right to interfere with the trade of another has been ably considered in the Court of Appeal in the case of the *Mogul Steamship Company v. M'Gregor, Goad, and Co.* The facts of the case were shortly these: Several steamship-owners trading to China agreed to lower their freights to whatever point might be necessary to drive another steamship-owner out of the trade. The latter brought an action for the damages sustained by him by what he alleged was an illegal combination. The Master of the Rolls held that it was illegal, and that the combined steamship-owners were liable to damages for any loss the plaintiff had sustained. The majority of the Court—Lords Justices Bowen and Fry—held, however, that as what was done was in the exercise by the defendants of their rights as traders, it was not actionable, although it incidentally injured the trade of the plaintiff. But all the Judges held that to intentionally injure the trade of another was *primâ facie* an actionable wrong. Lord Justice Bowen said: "Intentionally to do that which is calculated, in the ordinary course of events, to damage, and which does in fact damage another or that other's property or trade, is actionable, if done without just cause or excuse." Although the case I have referred to is the latest decision on the point, Chief Justice Hole—one of the greatest Judges that ever sat on the English Bench—in the case of *Keeble v. Hickeringill* said: "He that hinders another in his trade or livelihood is liable to an action for so hindering him. Why, otherwise, are scandalous words spoken of a man in his profession actionable, when without his profession they are not so . . . When a malicious or violent act is done to a man's occupation, profession, or way of getting a livelihood, then an action lies in all cases." He then goes on to point out that if a man, in the exercise of his trade, injures another rival trader, there is no wrong, because it is merely the exercise of his own legal right. It would seem, therefore, that an intentional injury to the trade of another, just as much as to his personal property, can only be justified where there is some legal excuse for it, or it is the necessary consequence of the exercise by the person causing it of his own right exercised for the purpose of obtaining advantages for himself. The same view was taken by the learned Judge in his summing up in the case of *The Queen v. Rowlands*, which was upheld by the Court, and is quoted by Lord Justice Fry in the Mogul Steamship Company's case above referred to. I am further of opinion that if the real object is to cause injury to the trade of another, the fact that the acts done are in themselves acts which the person doing them would, but for their effect, have the right to do, will not prevent the injury being in the eye of the law malicious, and therefore illegal. In the present case, the words and conduct of the defendants were intended to make, and did make, the prosecutor fear that the Union would unite and prevent his business going on. What was threatened, therefore, was certainly that the Unions would intentionally injure the prosecutor's business; and the only question is: Was there just cause and excuse for this? Now, it is undoubtedly true that the ultimate object which the defendants and the Union sought was their own benefit—certain non-Union men being induced to join the Union, and they thus obtained a monopoly of the labour market. But this was only the remote object of their conduct. The immediate object was injury to the prosecutor. The calling out of the Union men was not in itself unlawful; and if the men had agreed to come

out because they were dissatisfied with their work—whether as to the business or perhaps even as to companionship—this would not have made it illegal from the fact that it incidentally injured the prosecutor. But the object of the defendants was to injure the business; and the stoppage of their work did not arise from any desire in the men to leave their employment on account of their dissatisfaction with its conditions. There does not appear to have been any "just cause or excuse" for doing the injury to the prosecutor's trade which they knew would be, and intended to be, the result. The test which may, I think, usually, though perhaps not universally, be applied is: Would the same conduct have been adopted if it had been known that no injury to business would ensue? I am of opinion that in this case, but for the injury which it was known it would inflict on the prosecutor's business, the men would not have been called out. Whenever employers or workmen resolve to do acts with the intention of injuring the others in their employment or trade, the acts being such as they would not do if they did no injury, and they convey their intention to do the acts to the persons who will be injured either by words or conduct, with the object of compelling them, from fear of the injury, to do or abstain from doing what they have a legal right to do or abstain from doing, they in my judgment infringe the section, and are liable to punishment. To put the matter in popular language, I am of opinion that a strike by the members of a Trade Union for the purpose of increasing their wages or altering the conditions of their employment is lawful, unless accompanied by violence or intimidation to individual members or persons supplying the place of those on strike; but that a strike for the purpose of compelling employers not to employ other persons, or to alter the terms of the employment of such other persons, is illegal, and renders all persons engaged in it liable to proceedings under this section. I think, in conclusion, it may be worth while to notice the fact that in the Courts of the United States, where the common law of England prevails, and in some States where statutes very similar to that under consideration are in force, the Courts have laid down the law in a manner similar to that which I have done. I refer especially to a unanimous judgment of the Court of Appeal for the State of Connecticut (in the case of *The State v. Gluddon*), and a unanimous decision of the Court of Appeal for the State of Virginia. On the whole, for the reasons I have given, I am of opinion that this conviction must be affirmed. One question remains—viz., as to the sentence that should be pronounced. In my opinion the offence is a serious one, whether considered from the point of view of the public or of the prosecutor. The Act provides for its punishment, whether by fine or by imprisonment. It is an offence somewhat difficult to prove, and is not unlikely to be repeated if met by an inadequate punishment. Moreover, a fine which can be paid by the Unions would have a small deterrent effect; and, therefore, but for one consideration, I should have concluded that imprisonment, and not a fine, would have been the just punishment to award. But I believe that the defendants were not aware that they were acting illegally. I concur, therefore, with the view of the Magistrates, that in this case a fine is the appropriate punishment. But I desire to say that, now that the law has been clearly laid down, if any future case should come before me in which I have to pass sentence, I should probably treat it in a very different way. With respect to the amount of the fines, the injury inflicted upon the prosecutor has been considerable, and was intended by the defendants to be so; and I think the fines may reasonably bear some proportion to it. Further, they will, I presume, be paid by the Unions, with whose full authority the defendants acted, and whose members are really equally responsible. A levy to meet the fines that have been inflicted would not amount to more than a fraction of a penny upon each member. I cannot think that the amounts are excessive; and therefore I shall not make any alteration in the Magistrates' decision. I ought to add that it seems to me clear that though Curran was the chief speaker, the three defendants acted throughout in perfect accord; and I can see no reason, therefore, to make any distinction between their cases, or the fines imposed upon them. I am fully conscious of the gravity of this judgment; and if it is the wish of the defendants to question my ruling on any points of law, I shall gladly state a case for the opinion of the Superior Court.

In reference to the offer made by the learned Recorder at the close of his judgment, it was stated at the time by the appellants' Solicitor (Mr. Bromhead) that he had not been instructed to ask for a case, but that the fines would be paid and that there would be no further appeal. This decision, however, as already mentioned, has been overruled; and the opinion of the High Court of Justice will probably be sought on the question.

European Gas Company.—The Directors of this Company announce an interim dividend of 4 per cent.

The London County Council and the Water Question.—At the meeting of the London County Council last Tuesday, Mr. James Beal, the Chairman of the Special Committee on Water Supply and Markets, brought up a report, in which the Committee stated, with reference to the resolution adopted by the Council on the 9th of December last—that the Government be requested to institute an immediate inquiry whether any and what steps should be taken to provide a new and better water supply—that a letter had been addressed by the Chairman of the Council to the Marquis of Salisbury, stating that inquiry, authorized by an Act of last session, had already convinced the Council that there were strong *primâ facie* grounds for the belief that the Thames district would not long suffice for the needs of the rapidly growing population, and that an additional supply would soon be imperatively required. The Council had come to the conclusion that, in order to make the inquiry complete and satisfactory, it was desirable that it should be undertaken under the direction and with the aid of Her Majesty's Government. The Chairman, therefore, requested the Government to institute an inquiry whether the present sources of supply of water are adequate in quantity and quality to the growing demands of the population, and what steps should be taken to provide a better supply. He added that the Council were anxious that no time should be lost. The Marquis of Salisbury had replied that the matter should receive the careful consideration of the Government.

MISCELLANEOUS NEWS.

DISASTROUS ACCIDENT AT THE GLASGOW CORPORATION GAS-WORKS AT MARYHILL.

Two Gasholders Wrecked.

Last Thursday afternoon, about half-past four, a disastrous explosion occurred at the Dawsholm gas-works of the Glasgow Corporation; resulting in serious damage to property, including the wrecking of two large gasholders. Happily there is no loss of life to record; two or three workmen being only slightly injured. The Dawsholm gas-works occupy an extensive site at the outskirts of Maryhill between the Helensburgh line of railway and the canal. The three holders on the works stood close to each other in a straight line, almost due east and west. The western and central holders, known respectively as Nos. 1 and 2, are those which have been wrecked. They were of identical size; each measuring 160 feet diameter, and 90 feet high, and having a storeage capacity of 1,600,000 cubic feet. Both had recently been reconstructed and enlarged. When the accident happened, about 400 men were employed within the works. Few of them were in the immediate neighbourhood of the gasholders, which occupy an isolated site at some little distance from the various buildings in which the process of gas manufacture is carried on. So far as can be gathered from those who witnessed the occurrence, the first indication that anything was wrong was a great flame which was observed over the roof of the centre gasholder. It seemed as if a leakage of gas had in some way become ignited; but how the leakage was brought about, and, further, how the escaping gas was ignited, are points that at present are wrapped in mystery.

The *Glasgow Herald* describes the accident as follows: All the gasholders were two-thirds full of gas at the time. The flame shot high into the air, and attracted the attention of some workmen, who at once concluded that something serious was wrong. It was all the work of seconds rather than minutes; and before the great mass of flame had attracted the notice of others than those in the immediate vicinity, a loud rumbling noise, described by some as resembling the report of an earthquake, threw the whole population of Maryhill into the liveliest state of excitement. The roof of the gasholder had literally been blown off with the rush of the escaping gas. The report was heard all over Hillhead and in the western district of Glasgow; the windows of houses in many instances being violently shaken. For a minute or two the air was heavy with the liberated gas, which was converted into one huge mass of flame that shot high overhead as far as the canal, some 300 yards away. The security of the situation lay in the height at which the flames were from the ground. As it was, however, the western gasholder (No. 1) in a minute or two shared the fate of the other; the one report coming after the other in rapid succession. Precisely similar circumstances accompanied the bursting of the second gasholder; and in this case also the gas expended its force in an upward direction, blowing off the roof. Portions of the iron plates were carried to the top of the supporting columns, upon the framework of which they rested. In both cases the columns and the tank seemed to have escaped without serious damage. In a very short space of time the holders were empty; and they went crashing to the bottom of the tank. The flames, which had lit up the sky with a lurid glare that was visible miles away, died away as quickly as they had been born; and in four or five minutes the thing was practically at an end. The third holder escaped as mysteriously as the two others had been destroyed; and through its safety, portions of the city were redeemed from the fate of darkness. As it was, the supply of gas to the western district was considerably reduced. A man named M'Alister was slightly burned about the head; and a carter was also slightly scorched. One or two others were also a little scorched about the hands; but in no case was serious injury sustained. When the flames were at their height, they set fire to eight hay stacks 100 yards east from the gasholder.

Immediately on learning of what had occurred, Mr. W. Foulis drove to Dawsholm; arriving on the scene after dark. It would have been extremely dangerous to use a light for the purpose of making an examination of the holders; and Mr. Foulis properly declined to speculate as to the nature or full extent of the disaster. It is believed, however, that the force of the explosion spent itself in an upward direction and that the sides of the holders, as well as the tanks in which they are placed, remain intact. Following the explosion, the gas in many of the houses and shops in the city, but especially in the West End, was extinguished; and fully five minutes elapsed before the supply was renewed. Although Dawsholm serves the western portion of the city, the works at Dalmarnock and Tradeston are also connected with the main pipes in that district; and in this way the effect of the accident upon the locality principally involved was reduced to a minimum.

Writing on Sunday, our Glasgow correspondent said: The extraordinary occurrence at the Dawsholm Gas-Works of the Glasgow Corporation has resulted practically in the total destruction of the two largest gasholders in Scotland. The works are in the immediate vicinity of the suburban burgh of Maryhill, which is itself in the County of Lanark, from which they are separated by the River Kelvin, and are consequently situated in Dumbartonshire. When the works were constructed somewhere about fifteen or sixteen years ago, under the provisions of the Corporation Gas Act of 1869, there were three large holders erected, each of two lifts, 160 feet in diameter; the total height being 60 feet, and the available capacity of each being somewhat short of 1,250,000 cubic feet. These holders are set in a line parallel to the Glasgow and Dumbartonshire Railway, at right angles to the retort-house, but at a considerable distance from it; No. 3, the furthest away, being very near the Kelvin where it begins to make a sweep round the land embraced in the site of the works. This holder is still a two-lift one as laid down at first, but the others have or had been converted into three-lift holders. No. 1 had its third lift (30 feet in height) added upwards of a year ago; the contractors being Messrs. Clayton, Sons, and Co., Limited, of Leeds; and the additional lift was put on No. 2 holder last year by Messrs. Hanna, Donald, and Wilson, of Paisley.

This contract is so very recent that it has not yet been taken off the hands of the contractors. It was a most phenomenal accident which occurred on Thursday to No. 2 holder—that is to say, the one in the middle of the series, which is probably not more than about 6 feet from No. 1 at the nearest part. A loud noise was heard, as if it were the sudden ripping up of the iron plates or sheets forming the crown of the holder in question; and this seems to have been immediately followed by a booming sound quite unlike that of an explosion either of mixed gas and air or of dynamite—the material which caused the memorable explosion at the Tradeston gasholder by Fenian miscreants just eight years ago. Almost immediately afterwards, if not simultaneously with the ripping up of the holder crown, the contained gas became ignited; the volume of the flame produced being such probably as has never been known in Scotland before from any cause. Being just at the "gloamin'," this immense mass of flame was seen at places many miles distant. No. 1 holder appears to have passed through the same brief series of acts; but in this case the crown seems morally certain to have been ruptured by pieces of the plating of No. 2, in the form of projectiles. The work of destruction was effected in a very brief space of time, measurable almost in seconds rather than in minutes. When the accident happened, there were very few persons in the vicinity, and those who were within reach were not much injured. Mr. Wilson, the Works Manager, was in his office on the other side of the retort-house; and he at once made his way to the holders with all possible speed, and took control of the various inlet and outlet valves. He believes that not more than four or five minutes can have elapsed till he had everything made secure. The delivery of gas to a large part of the city and the western suburbs was interfered with; but only for a brief space of time, as No. 3 was very quickly turned on to the principal main. Mr. Foulis was at once telephoned for. By the time of his arrival at the works, darkness had completely set in; and he forbade any examination to be made involving the use of naked lights. An inspection as soon as there was daylight on Friday morning showed that there had been an extraordinary amount of destruction, which seemed, however, to be confined to the top lift in both cases. The columns and bracing rods were quite intact; thus showing that, in all probability, the escape and firing of the gas had been wholly in an upward direction. In both cases the several lifts were completely telescoped within one another within the respective tanks, the top one being largely under the surface of the water contained in the tank. A number of the members of the Corporation Gas Committee and other interested persons joined Mr. Foulis at the works early in the day, and measures were taken to secure the continuity of the gas delivery to the consumers. Mr. Foulis was authorized to obtain steam fire-engines from the town to commence to empty the water out of the tanks; and these were added to yesterday. He was also authorized to telegraph to Mr. George Livesey to help in making an inspection, so as to endeavour to arrive at some satisfactory explanation of the disaster. That gentleman arrived in Glasgow early yesterday (Saturday) morning; and on getting to the works at Dawsholm, he was joined by Mr. Andrew Gillespie, of the Barrowfield Ironworks Company, Limited, a gentleman who has had a vast experience in the construction and repair of gasholders. These two gentlemen were engaged during most of the day with their inspection; but it was concluded eventually that nothing definite could be done in the way of solution of the mystery of the first rupture or bursting of No. 2 holder until the tanks have been pumped dry. One of them will probably be emptied to-morrow, and the other by Thursday. Meanwhile Mr. Livesey has returned to London, and his place will likely be taken in the course of the week by Mr. A. F. Phillips. The injury done to the holders will amount, it is thought, to something like £20,000; but nothing definite on this point can be determined until a more careful and complete inspection of the wreck can be carried out. There are many theories thrown out as to the cause of the first rupture of No. 2 holder, and then as to the ignition of the gas; but these need not now be enlarged upon. The pumping operations were proceeding vigorously when a call was made to-day (Sunday) on behalf of the writer.

THE PURCHASE OF THE CROYDON GAS-WORKS BY THE CORPORATION.

An Attempt to Revive the Question.

The *Croydon Guardian*—a paper which a few years ago strongly advocated the purchase of the gas-works by the Corporation—has been trying to stir up the question again. In the course of an editorial article last Saturday week, it gave expression to the following: The supply of gas or any other illuminant to a large borough like Croydon ought not to remain for a moment longer than is actually necessary in the hands of a monopolist Company. Surely the ratepayers who three or four years ago rejected, on account of its assumed extravagance of price, the purchase of the Croydon Gas Company's property will be inclined to take a different view, or at any rate be prepared to consider the propriety of taking some fresh steps to acquire this property. The profits which the Corporaton would have made during the past few years would have nearly paid off one-sixth of the purchase-money! Every municipal authority that has acquired gas property has been not only able to supply gas at 30 per cent. lower than private companies, but have paid nothing for street lighting, and have made large profits, and so reduced the rates. The number of local authorities undertaking the supply of gas has increased from 148 in 1883 to 173 in 1889. London pays £4,400,000 for gas, which costs only £2,900,000 to produce; thus throwing into the pockets of shareholders every year £1,500,000! No wonder the gas companies pay dividends varying from 7 to 14 per cent. Large towns like Liverpool, York, and Sheffield are still in the power of private Companies, paying their shareholders 7 and 10 per cent.; and yet Sheffield only charges 1s. 11d. per 1000 cubic feet. But the municipal boroughs which control the supply of gas—such as Manchester, Leicester, Bradford, &c.—have found that from the profits gained, they have enough to pay for parks, free libraries, city improvements, and markets, while they charge less than private companies, and get their street lighting for nothing. Consequently, it ought not to be a question whether we should purchase the Gas Company's property or not, but the best means to secure it as quickly as possible. There need be no sentimental feeling about the thing at all; and there need not be one penny more paid for the property than its actual market value. All corporations can avail themselves of the Act of Compulsion; and since amicable transactions of this kind usually lead to long delay and probably to fancy prices, the other mode open to local authorities is the fairer of the two. There are many costly things in Croydon to pay for. The High Street improvements, the free libraries, and recreation grounds, to say nothing of the necessary paving which the borough needs, means a very large outlay. If this can be met by the profits arising from the supply of gas, it means a considerable reduction in our rates. In a word, it means becoming large shareholders in the Gas Company, and putting the dividends of the future into our own pockets.

THE PRICE OF GAS IN ST. LOUIS (U.S.A.)

A short time ago we mentioned that an ordinance had been passed by the Municipal Assembly of St. Louis (U.S.A.), to the effect that the Laclede Gas Company should not charge more than 90c. or 95c. per 1000 cubic feet for gas. This was vetoed by the Mayor; and then a curious condition of things followed. The Assembly re-enacted the ordinance, and attempted to enforce it; but in this they were frustrated by the Corporation obtaining an injunction to restrain them from proceeding until the Supreme Court had given its opinion on the legality of the act of the authorities. This it has now done, entirely in the Company's favour. In order that our readers may clearly understand the situation, we give the following history of the case: In 1886 the old St. Louis Gaslight Company secured an extension of their Charter for 25 years, on condition that they would accept an ordinance regulating their right to charge only $1·50 per 1000 cubic feet for gas from the date of the acceptance up to the end of the year 1889, and $1·25 from January, 1890, to January, 1920. This arrangement was in due course agreed to by the Company, on behalf of themselves, their successors, and assigns. On December 24, 1889, the St. Louis Company sold their undertaking to the Laclede Company; the latter accepting all the conditions contained in the ordinance. Some time afterwards, the Company voluntarily reduced their price to $1 18·75c. per 1000 feet; and subsequently the City passed the decree which led to the dispute, and which was to take effect from March 31 last year. The points at issue between the parties were four: (1) That the St. Louis Gaslight Company had no power to contract with the City as to matters necessarily extending beyond the limit of their chartered existence; (2) that the first ordinance did not exempt the Laclede Company from regulations by the City as to the price of gas; (3) that there was nothing in the Charter of the Company which forbad the reduction by the City of the price of gas after the 1st day of January, 1890; and (4) that even if the ordinance and its acceptance might be regarded as constituting a contract, that contract, if it had the effect claimed for it by the Company, was beyond the power of the City to make—being nothing less than a futile attempt to barter away "a police governmental power affecting the health and welfare of the people of St. Louis." As to the first point, Judge Sherwood held that a corporation had the right to convey real, personal, or other property under the same circumstances as an individual; that the ordinance clearly contemplated that the rights granted to the original Company would be by that Company handed over to its successor; and that when the property was transferred to another Company, the contract became one between the City and the transferee. As to the second point, he held that the original ordinance did not warrant the construction placed upon it, and that the contract was a valid one between the City and the St. Louis Company. In answer to the third point, he quoted the provisions of the Charter granted to the Laclede Company on March 2, 1857, which gave that Company authority to lay pipes, and make and sell gas in the city of St. Louis, and made no limitation as to the price to be charged for its product. On this point he remarked that the power to make and sell gas carried with it, as an inevitable incident, the right to fix the price. No other conclusion could be drawn from the premises. A sale implied a price; and whatsoever the law necessarily implied in a statute or in a contract was as much part and parcel of it as if expressly stated therein. The answer to the fourth point may be summed up as follows: "If, as claimed, the power to regulate the price of gas had been granted by the State to the City as a police governmental power which could not be bartered away by the State, then the Charter of the respondent Company was valueless when it came from the hands of its grantor. It is not to be doubted that there is a limit to the power of the Legislature to tie the hands of subsequent legislators in respect to the exercise of what is termed the 'police power.' But certainly there is a limit in this regard over which legislators and municipalities cannot pass. They cannot, in the exercise of assumed police powers, violate Charter contracts and overthrow vested rights." In conclusion, he said the Court held: (1) That the Charter of the Company was a contract between them and the State which authorized them to fix the price of their gas, which price could not be diminished by subsequent legislative action, whether State or Municipal. (2) That the original ordinance when accepted by the St. Louis Company, constituted a valid contract between the Company and the City. (3) That by the subsequent transfer by the original Company of their property, rights, franchises, &c., to the Laclede Company, and by written acceptance by the latter of the conditions therein set forth, a like valid contract was formed between the City and that Company. (4) This contract was beyond the power of the City to impair, or in any manner affect, by the mandatory ordinance they had passed.

The Cost of Coal for Gas Making at Leeds.—At a meeting of the Gas Committee of the Leeds Corporation last Wednesday, it was mentioned that the cost of the coal used in the manufacture of gas for the borough during December was larger than it had ever been in any previous month; the sum paid being £20,000.

MANCHESTER CORPORATION GAS AND WATER SUPPLY.

The Thirlmere Water-Works and the Gas Profits—The Use of Gas-Stoves—Gas at Cost Price.

In last week's JOURNAL there appeared a paragraph and some editorial comments regarding a proposition which will shortly come before the Manchester City Council for applying some of the profits of the Gas Committee to the purposes of the Water Department. This matter was first referred to by Sir John Harwood in the course of a statement on the financial aspect of the Thirlmere water scheme at the meeting of the City Council last Wednesday week; and the suggestion has since called forth some adverse criticism in the correspondence columns of the local newspapers. One letter, emanating from Mr. Charles Darrah, is especially interesting. He acknowledges that the speech of Sir J. Harwood was an "able and masterly" one, and showed a grasp of details connected with the water supply probably unequalled; but the proposition to apply the "so-called gas profits to the purpose of meeting the liabilities of the Water Department," he thinks is "vital to the immediate well-being of the community" and "fatal to progress." The citizens of Manchester make their own gas; make it for themselves for their own use. Why, then, asks the writer, should they charge themselves more than it costs them to make? Why should they make a profit out of themselves to share amongst themselves? It would seem as reasonable for a family which does its own washing, baking, &c., to charge itself retail prices, and take the difference in cost out of the right-hand pocket to put it into the one on the left. But it is not only a question of finance (the letter proceeds), it is also a question, in many cases, of life, of health, of comfort, and also of trade and commerce. In London in the previous week [the letter was dated Jan. 10], Dr. Thomas held no fewer than 30 inquests; the majority being on persons who had died suddenly. In the course of the inquiries, Dr. Thomas stated "that there had been a large number of sudden deaths of late among elderly people," and remarked "that it was a mistake for old persons, after they had been seated by a warm fire all day, to go up to cold bedrooms, because they obtained a chill and congestion of the lungs, and this caused the heart extra exertion, which it was unable to stand in its weakened condition, and so sudden death followed." The use of a small gas or coal fire in these cases would, doubtless, have saved many lives. But, observes Mr. Darrah, gas-fires are dear if in continuous use, and coal fires need replenishing, and in addition, make much extra work; and so, between the two evils, many lives are sacrificed. It is mainly the cost that stands in the way of the increased use of gas-fires, for not only is gas preferable to coal in such cases for its comfort and cleanliness, but also for the unvarying temperature it maintains, and besides it does not pollute the air with smoke. During this severe weather no greater boon could be bestowed upon the aged, the convalescent, the consumptive, or those bronchially affected, than to let them all have properly fitted gas-stoves in their bedrooms, which would maintain, at the time when the body needs it most, an even temperature, with due ventilation and without the great risk run in such cases of finding the fire almost or quite out, and having to rise and replenish it. In the matter of air pollution by smoke, the writer points out that it is not the factories and workshops which are the only, or even the chief, offenders, but it is the open fireplaces in cottages, private houses, and warehouses which are the principal cause of this scourge. To remedy this acknowledged evil, there have been numberless improvements in grates and fireplaces, but the public will not buy them, and out of the few persons who do, the majority soon tire of them and wish they had never bothered with them. "It would therefore appear," continues the letter, "that the only feasible remedy for our smoke-laden atmosphere is cheap gas; and just as surely as gas has superseded candles and oil for public lighting, so surely will it also supersede coals for cooking and heating and manufacturing when the people for whom it is made are able to get it at the price it costs them to make it—all needful depreciation being taken into account. But it may be said that the Gas Committee have already striven to further the consumption of gas by selling and loaning gas-stoves. Now, not only is this beginning at the wrong end, but I also maintain that this action of theirs is illegitimate and wholly outside the proper functions of a committee of a city corporation. The coal-owners do not endeavour, nor do they find it needful to promote the use of coal by selling or loaning fire-grates, or the oil company that of oil by selling or loaning oil-stoves. But they each produce their articles and place them on the market at the lowest price, and trust to the natural laws of supply and demand to do the remainder; and they are not disappointed. In each case, however, they make a profit out of the price at which they sell, and must do, or they would cease to trade, but the citizens of Manchester make gas for their own consumption; and the sale of it at cost price would probably increase the use of it beyond all expectations. What is needed in this city is not attempts to bolster up the price of gas by artificial means, to the injury of hundreds of deserving and ratepaying tradesmen, but on the contrary to reduce the price of gas to cost—thus making it everyone's interest to use it freely; and the Corporation may then fully depend upon the gas-fitter, the merchant, and the manufacturer to put the most useful patterns of gas-consuming apparatus before the public at competitive prices. The supply of gas at cost price would so stimulate its use in our homes, workshops, factories, and manufactories that in a few years our climate would be improved almost beyond recognition; for not only would there be the absence of smoke from the use of gas instead of coal, but the vastly increased output of coke would also displace its equivalent of coal, and we should thus gain in both ways, and the very young and very old, the weakly, and the infirm would be able to live where they are now being killed off." In conclusion. Mr. Darrah says he considers Sir John Harwood's proposal a retrograde step; and he respectfully urges upon him to find some other means of raising the required money. Another correspondent—Mr. William Thomson—writes in a similar strain to Mr. Darrah. He observes that it always puzzled him how it is that the Manchester Gas-Works show a "profit" when the consumers of gas supply themselves. The answer usually given is that if the so-called profit is used for the reduction of the taxes, it comes to the same thing as charging less for the gas and levying another tax for something else. "This," he says, "could only be true if everyone in Manchester used relatively the same amount of gas; which they do not. Suppose A in the conduct of his business uses per annum £100 worth of gas, and B, occupying precisely the same position as A, uses £5 worth. Assume that Sir J. J. Harwood takes 10 per cent. of the cost of the gas per annum for the water scheme, then A as his share of the water scheme pays £10 whilst B pays 10s. If it be necessary to tax for water, why should A and B not pay each £5 5s.?" The letter concludes as follows: "If gas were much cheaper than it is, people would use gas instead of coal for fuel to a much greater extent than they do; and this would greatly aid in preventing pollution of the air. If the sinking fund and the so-called profit (neither of which should now be charged against the gas) were stopped, gas could probably be produced at about 1s. 6d. instead of 2s. 6d. per 1000 cubic feet; and if it were supplied, as it should be, at this price, a great improvement would soon be effected in the degree of impurity of the atmosphere. I trust that Sir. J. J. Harwood's proposal will be successfully opposed, and that a further step in the right direction will be made by supplying gas at what it costs to produce."

BRADFORD CORPORATION GAS SUPPLY.

Extension of the Birkshall Works.

At the Meeting of the Bradford Town Council last Tuesday—the Mayor (Mr. E. W. Hammond) presiding—Alderman F. Priestman moved the adoption of the minutes of the Gas and Electricity Supply Committee, which included a resolution authorizing plans and specifications to be prepared for the extension of the Birkshall gas-works. He pointed out that the Committee were not at once asking for the authorization of any expenditure, and assured the Council that, before they spent any money, they would bring to their attention the whole of the estimates of the cost, which should be as small as possible. During the week before Christmas, the total quantity of gas consumed, he said, was 52,010,000 cubic feet—being an average of 7,430,000 feet per day, including Sunday. This was the largest consumption the Committee had ever had to deal with. On Monday in Christmas week the consumption was 7,800,000 feet; and on Tuesday, 7,480,000 feet. The members would be aware that there was a scarcity of gas during this period. This was one of the circumstances which led the Committee to see that it was absolutely necessary to extend the works. On the 2nd inst. all previous records were beaten by a consumption of 9,251,000 feet; and it was a singular coincidence that the largest previous day's consumption was on Jan. 2 last year, when the figures were 8,911,000 feet. Mr. Cowgill observed that he had heard that all street work in connection with the electric lighting was done by the Corporation workmen, and was superintended by a Corporation foreman. He, therefore, desired to know whether Mr. Shoolbred, the Engineer, obtained a commission upon the cost of the works that were executed in this way. Mr. Galloway asked the Chairman not to let the expense of the new extension at the Birkshall gas-works amount to an extravagant sum. The first figure he had heard mentioned in connection with this matter was £12,000, then the estimate rose to £16,000, then to £20,000, and the last figure he had heard was £30,000. Alderman Priestman replied that Mr. Shoolbred had been paid, since the electric lighting works were commenced, a sum of 3 per cent. upon the outlay. Whether this percentage was allowed upon expenditure in the streets, he could not say. As to Mr. Galloway's plea, he had already said that he would bring in the estimates before any action was determined upon. They proposed to obtain estimates for a retort-house, purifying-house, and a station meter; but during the coming year, he thought they would be able to go on by putting up the retort-house and one bed of retorts. He did not know where Mr. Galloway obtained his figures from; but he did not think the expenditure in the first instance would exceed the lowest amount mentioned by him. The minutes were passed.

Heavy Claim against the Cardiff Corporation.—A long discussion took place at the meeting of the Cardiff Corporation Water Committee last Friday week as to some correspondence between the contractor for the Cantref reservoir and the Engineer relative to misunderstandings between the former and the clerk of works. The communications from the contractor included a claim for £23,783 for extra expense occasioned by delays and work caused by the interference of the clerk of works. It was decided that the correspondence should be further considered.

The Proposed Purchase of the Lisburn Water-Works by the Town Commissioners.—In view of the proposed purchase by the Town Commissioners of Lisburn of the water-supply works, from Lady Wallace, an engineer was engaged by the former to inspect them. He reports that he considers the works are very defective, so far as storeage is concerned; and before the supply could be considered satisfactory, it would require to be doubled. The drainage area is said to be ample for the supply for many years to come. The price asked by Lady Wallace for the works is £15,000.

The Alleged Lead-Poisoning at Wakefield.—Since the Corporation of Wakefield have obtained a supply of water for the city from the Rishworth Moors, near Halifax, frequent complaints have been made to the effect that the action of the soft water from the moors and the Penine range on lead water-pipes causes lead-poisoning. Some time ago the Corporation submitted to Dr. Tidy samples of the water for analysis; and he reports that he considers it an excellent water, of great purity, and well-fitted for a town supply. He does not believe that any real practical danger or injury can arise from its use even when lead pipes are employed. He admits, however, that some very exceptional constitutions are affected by minute doses of lead; but his experience proves that the subject of lead-poisoning by water is one that lends itself in a special manner to sensational statements.

THE DANGERS OF THE ELECTRIC LIGHT.

We have frequently had occasion to record accidents—several of them fatal—resulting from the adoption of electric lighting. In most cases they have been caused by the powerful currents necessary to produce the light, or by some defect in the appliances used for their transmission. It must be admitted that electricians have deplored these disasters; but while acknowledging the imperfections of their system, they have generally defended it on the ground of its all-round superiority to gas, especially from a hygienic standpoint. A few weeks ago we ventured to question this in discussing the subject of ventilation; and it will be seen from the following communication, which has been forwarded to us by a correspondent, that it is open to attack from another side—viz., its detriment to health. The unreliability of the light is a vagary which may, in the course of time, be remedied; but its deleterious effect on the human organism, to which attention has lately been directed, is a matter that is beyond the scope of the electricians, and comes into the domain of the physician. Our correspondent remarks:

A few years ago the most extravagant claims were confidently advanced for the electric light, which was not only to give us a brilliant, reliable, and safe illuminant, but a most healthful one. Year by year and month by month some of these extravagant claims have been falsified. No doubt the electric light is a splendid illuminant; but we now know that it is an expensive light. We also know that it is by no means so safe as it might be, or as many electricians would have us believe it to be. Accidents to persons and property by means of electric lighting apparatus are becoming familiar. The electric light installations that were to give us absolute safety from fire have caused several conflagrations; they have also caused many deaths. In this matter, considering the time it has been in use, it hardly compares favourably with gas. Its reliability has turned out to be merely a relative term, for many awkward mishaps have occurred all over the country through trusting implicitly to the electric light. On occasions too numerous to recall here, the light has failed signally, just at the moment when it was most needed; thereby, in more than one instance, causing panics. Prudent people who take up the new "fad" of electric installations (for as yet our electricians are very far from being masters of their science) still keep the trusty gas in reserve; so that when the fickle electricity plays a trick, and leaves a theatre or hall in darkness, the gas can save the situation and prevent great calamities. Many of the installations show an irritating tendency to enact the parts of wilful will-o'-the-wisps. Readers in the British Museum Reading-Room know full well what "high jinks" electric lights can play; and recently the foggy weather in London has brought out most prominently the weak points of more than one vaunted system of lighting by electricity. And thus on all points the claims advanced by electricians for their illuminant must be carefully hedged about by endless safety clauses, through which the too hasty champions may beat a retreat.

Experience is an expensive school through which we must all pass. In the case of electric lighting, it has taught us that the new light is not reliable and is not absolutely a guarantee against fire or loss of life; and now we have reason to believe it is certainly not without having deleterious effects on the health. Electricians have been particularly loud in claiming for electricity the great advantage over gas that it is most healthy. No doubt the electric light does not contaminate the air with noxious gases; but medical men have long since acknowledged that electricity, without certain precautions, might, and often did, injure the eyesight. As in this respect heat was out of the question, the injury done to the eyes was put down to the excessive brilliancy of the light. We may now ask if that was the only cause. If we are to believe the remarkable statements of a French *savant*, we must answer that there are other powerful agencies at work. Dr. Desfontains, a member of the *Académie de Médecine* of Paris, is the chief of the medical staff at the well-known iron-works and coal mines at Creusot. Both in the works and down in the mines electric lighting is employed. Of course Dr. Desfontains keeps a register of the health of the army of men engaged; and he speedily became aware that those men down in the coal and iron mines were subject to peculiar forms of disease, the symptoms of which had something in common with those present in cases of sunstroke. Investigation explained this strange state of affairs. It was found that the men who suffered were those exposed to the glare of many electric lamps of high candle power. Men who were peculiarly sensitive to electric phenomena suffered most. The symptoms naturally differed, but only within a narrow range. Briefly stated, it was found that, after working under the powerful electric light for periods varying from 45 to 90 minutes, men became affected as though by insolation. Their faces, necks, hands, and any parts of the body left uncovered, began to itch; an irritating sensation like "pins and needles" was felt; the skin became red, and in bad cases would peel off. The eyes also suffered. Everything put on a saffron hue to those affected; and sometimes this symptom was accompanied by severe pain. Indeed, the effect on the eyes is very noticeable. The lachrymal glands are so stimulated that tears roll down the cheeks, and luckily cannot be restrained. I say luckily, for if it were not for these tears the eyes might be permanently injured; the conjunctiva being greatly inflamed (the inflammation lasting many days in some cases), and a painful sensation of grittiness being felt under the eyelids. As to the general state of health, the above symptoms were accompanied by fever, headache, and, Dr. Desfontains says, permanent lesion of the brain tissues.

Now, all the symptoms above enumerated cannot be the result of heat; for certain of the sufferers have been affected while working some twelve yards from the electric lamps. Dr. Desfontains does not hesitate to attribute the phenomena to the chemical action of the electric light rays. His experience with the thousands of men at work should make his statements authoritative; so when he says that powerful rays from electric lights must tend to the deterioration of the retina, the conjunctiva, and the brain substance, we may well ask for increased care and attention before we go too far with electricity. It is easily to be understood that the harmful effect of the electric light should have escaped the attention of medical men, for, after all, this system of lighting is a new feature in social economy; and it is only quite recently that we have had powerful electric lighting in mines and similar confined spaces. Naturally, confining the electric light under such circumstances as those existing at the Creusot works would bring out any intrinsic chemical powers possessed by the rays. But if the electric light ray, when strong and in a confined space, can cause serious physiological disturbances, it is clear that, in a lesser degree, it will probably always have a deleterious effect; and it then becomes a question of degree. Anyway, physicians should take special note of Dr. Desfontains' statement, and see whether in private practice any symptoms approaching the above are to be observed. Seeing that the tendency is to increase the use of electricity in mines and workshops, Dr. Desfontains' assertions should receive every attention before possible great harm is done.

PROPOSED PURCHASE OF THE IPSWICH WATER-WORKS BY THE CORPORATION.

At a Special Meeting of the Ipswich Town Council last Wednesday week—the MAYOR (Mr. F. Turner) presiding—the question of whether steps should be taken with a view to the acquisition of the property of the Water Company was under consideration.

Mr. D. FORD GODDARD, in accordance with notice, moved—"That the question of the purchase of the Ipswich water-works undertaking be referred to a Special Committee, with power to negotiate with the Water Company as to terms, and, if necessary, to call in such assistance as will enable it to make a recommendation to the Council, both as regards the purchase and the financial arrangements by which it can be most judiciously carried out." In the course of his remarks, he said that this matter had been many times before the Council. Reports were made on the subject in 1874, in 1878, and in 1880; but all efforts had ended in failure. Under these circumstances he felt that no apology was needed on his part for once more introducing the question, after the expiration of eleven years. He held it to be a principle generally accepted, and one from which very few would dissent, that all such monopolies as water-works, gas-works, and the like should be in the hands of the people or their representatives. He purposely said "and the like." As a proof of the general acceptance of this principle, he might say that there were in the United Kingdom 63 towns which had a population of 50,000 and upwards; and of these 50 had the control of the water supply of their own districts, and only 13 had not. He did not wish to say a single word in hostility to the present Water Company or their management. He had no wish to try to prove that they had failed in their water supply, either in quantity or in purity. He simply said, as a matter of public policy, that the Corporation of a town like Ipswich ought to acquire the right of full control over the water supply. In support of this proposition, he quoted the observations of Lord Derby, as Chairman of a Select Committee of the House of Lords, in 1887, to consider the Bill promoted by the Corporation of Sheffield for the purchase of the water-works of that town. Lord Derby said: "The Committee have come to the decision that it is expedient that the works of the Sheffield Water Company and the control of the water supply should be transferred to the Corporation. They have come to this conclusion on the ground of public policy. They do not consider that there is any proof of mismanagement or failure of duty on the part of the Company; and they think therefore that the terms of purchase should be not only fair, but liberal." When an attempt was made to purchase the Ipswich Gas-Works, there were some members who were in a little fear on the ground of possible competition by the electric light; but he (Mr. Goddard) supposed that few would now be found who did not regret that that purchase was not carried through. But as regarded the question of the acquisition of the water undertaking, no such difficulty could possibly arise; for there was no possibility of competition. The Corporation of a town was the Sanitary Authority, and was responsible for the health of the town. The first condition of that health was the water supply, and that the water should be pure and plentiful, not only for drinking purposes, but also for cleansing the drains and for other sanitary matters; and he held that, even if it could be contended that there would be no financial advantage to the Corporation from the purchase of the works, they still ought to acquire them, because at the present time they were standing with their hands tied in regard to many public improvements—such as baths and wash-houses. He did not pretend to state that there would be any financial advantage to be derived by the town; and he did not wish to mention any figures which might hamper the Committee which, he hoped, would consider the question. He would not go beyond the broad proposition that the majority of the towns which had purchased water-works were finding them to be a financial advantage. The total receipts by local authorities in England and Wales from water supply in 1887-8 were £2,267,932; and the total expenditure for procuring and distributing the water was £879,167—leaving a surplus of £1,388,765. This sum was ample to pay interest and sinking funds on the enormous outstanding balance of debt, amounting to about 35 millions, to reduce the price of water to consumers, and to relieve the rates to a considerable degree; and he did not hesitate to say that in Ipswich there was every reason to anticipate a similar result. There was no doubt that the town was increasing so rapidly that the profits would be out of proportion to the additional outlay of capital necessary to convey water to the new districts. The purchase would also very largely facilitate the consolidation of the entire debt of the borough; and he also believed there would be a considerable saving in the cost of collecting the water-rate. Another advantage would be that they could use the tidal water for flushing the sewers and watering the streets. Anticipating an objection to the employment of professional assistance, Mr. Goddard justified it on the ground that it was only by such help they could hope to bring the matter to a definite issue, and approach the Water Company in a friendly spirit, with some hope of arriving at a fair estimate of the value of their undertaking.

Mr. W. O. WHITE seconded the motion.

Alderman WRINCH said he had been a member of all the Committees which had considered this question. He was entirely of Mr. Goddard's opinion that it was desirable to purchase the water-works; but he was sorry that gentleman had included in his motion power to call in an expert, as he maintained there was sufficient information in the reports of the Committees of 1878 and 1880 to enable them to commence negotiations with the Company. If Mr. Goddard had been on the two former Committees, he would recognize the difficulties there were in purchasing otherwise than compulsorily. They had already spent some 500 guineas for experts; and he was not prepared to spend another large sum in that way.

Mr. E. PACKARD maintained that the principle Mr. Goddard had advocated was the right one. Mr. Goddard had mentioned the proposal to purchase the gas-works. He (Mr. Packard) wished that gentleman had been of the same opinion a few years ago, in which case the Corporation would probably have now been in possession of the works. If the present suggestion were carried out, they would be doing what would be a wise thing for the future, though he did not think they would gain any immediate advantage.

After further discussion, in which objection was taken to engaging an expert,

Alderman JOSSELYN, who said he could not support the resolution in the form in which it stood, moved, as an amendment—"That it is advisable that the town should acquire the water-works on fair terms; and that a Special Committee be appointed to inquire and report how this object can best be effected.

Alderman TURNER seconded the amendment.

The MAYOR remarked that his sympathy was entirely with Mr. Goddard, who had brought the question before the Council in a very able manner. The purchase of the water-works had always been an object he (the Mayor) desired to see accomplished; and it would give him great pleasure if it could be carried out during his mayoralty.

The amendment only found three supporters; and Mr. Goddard's resolution was carried almost unanimously.

The Burslem Town Council and Inclined Retorts.—On the recommendation of the Gas Committee, the Burslem Town Council have agreed to the appointment of a deputation to accompany the Gas Manager (Mr. H. Peaty) to inspect the system of inclined retorts with a view to reporting as to its adoption.

Gas Stokers and Water-Gas Plant in America.—It appears that the stokers in the Boston (U.S.A.) Gas-Works are displeased at the introduction into the retort-house of water-gas plant, and they have publicly given vent to their feelings on the matter. A "local assembly" of the world-renowned Knights of Labour, consisting largely of employees of the old Boston Gas Company, recently met in solemn conclave, and decreed that "the continued introduction of water gas is an imposition upon the public; it gives the people an article far below coal gas in illuminating power, and throws a large number of men out of work, without giving the consumer a corresponding benefit in the reduction of his gas bill."

Northern Coal Trade.—The coal trade was steadier last week; orders having been booked from some of the Scotch ports, where the local coal is interrupted by the railway strike. For gas coals the demand is still large; the foggy weather having reduced the stocks of certain of the gas companies. The price varies very greatly; some of the best collieries asking 11s. per ton free on board, while for other qualities 10s. 6d. per ton, and even less, is taken. The consumption of gas coals is, however, now showing signs of falling off, as usual at this time of the year. For coke the inquiry is good; and for best blast-furnace qualities, about £1 per ton is the general quotation. There is no alteration in the price of gas coke; but the production is very large just now.

Liverpool Corporation Water Committee and the Vyrnwy Supply.—Yesterday week the Vyrnwy Works Committee of the Liverpool Corporation Water Committee had a lengthy discussion as to the action it was desirable to take, in view of the serious diminution of the stock of water in the reservoirs, to expedite the completion of the aqueduct under the River Mersey, and so secure a supply for the city from Lake Vyrnwy. It was moved by Mr. Holme that the Engineer (Mr. G. F. Deacon) be requested to prepare plans and estimates for the construction of a temporary pipe-line across the Mersey, either in the bed of the river, or at a convenient elevation above it; and that the Town Clerk be instructed to obtain the sanction of the Mersey Conservators, the Board of Trade, and the Warrington Town Council to the arrangement. If a pipe-line were provided, they would be able, he said, to have a supply of water from Lake Vyrnwy in a comparatively short time, and at an additional expense of from £3000 to £5000. The construction of the tunnel under the river would be proceeded with in the ordinary course. The resolution was unanimously adopted.

The Illuminating Power of the Gas at Portsmouth.—The report submitted to the Portsmouth Town Council as to the illuminating power of the gas supplied in the borough during October last showed that on two occasions it was below the prescribed standard; and in the report for November, the Inspector stated that there had again been a deficiency. After each report a communication was sent to the Gas Company; and in reply to the second, it was stated that one reason for the illuminating power being lower than the standard was the fact of spontaneous combustion having taken place in the coal stored on the works, whereby a large portion of the gas-making properties was lost. To remedy this as far as possible, oil was added to the coal. When this matter was under consideration at the last meeting of the Council, Mr. Foster moved that the Council instruct the Lighting Committee that, should a deficiency again occur, steps must be taken to prosecute the Company. The motion having been seconded, Mr. Ross proposed, as an amendment, that an immediate action be instituted against the Company for having supplied gas below the required standard. This was seconded by Mr. Dittman, who said he thought it was time the Council made an example of a rich and powerful Company, who only seemed to consider the interests of their shareholders. On the matter being put to the vote, however, the amendment was lost, and the original resolution was carried.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday*.

Another week—the fourth—of the railway strike; and it shows no sign yet of coming to an end! There is a great deal of traffic on the railways; but it is mostly by new hands who have been taken on since the strike began, and who are rather unreliable in the matter of signals and the like. The men are obtaining a great deal of adventitious, and a small amount of material support from the public; and if left to themselves might be expected to give in very soon. But so long as the 10s. or 12s. 6d. per week can be paid to the men on strike, although it is a trifle compared with the £2 to £3 which many of them earned before, they will hold out for some weeks yet. There are signs also that the trades' organizations are being aroused on their behalf, which gives them encouragement. This afternoon there was a demonstration of the trades in the Queen's Park, in Edinburgh—the largest I have seen since the great outburst against the Criminal Law Amendment Act, in 1873. Citizens' committees are also being formed in several places in their support; and it is threatened to bring out the miners and other workers, to strengthen the position of the strikers. With all these aids being given to the men, it is more than ever incumbent upon employers to combine in support of the Companies, in order that they may not be coerced into giving away the situation. There is no occasion yet for alarm, because the Directors of the Companies are as firm in resisting the demands of the men as they were on the first day of the strike; the danger lies in the men getting support from outsiders, which will enable them to starve out the Companies. The men are obtaining support; why should not the Companies? True the Companies are being supported by traders, but to only a very small extent; and in that connection it is instructive to observe how a difference of situation alters the view. At every meeting of the men, subscriptions from outsiders are announced, and are cheered to the echo. Another countenance is put on when it is intimated that help is being given to the Companies. For instance, the Chairman at the Edinburgh meeting of the men on Thursday afternoon stated that two men at the Corporation gas-works in Edinburgh had been coerced into going on the North British system, and along with North British men, to bring coal into the gas-works; that one of them refused to do the work, and that they were told if they did not do it, they knew what they could do; and that he thought they should call upon the Lord Provost to take very distinct action in the matter. He added that Mr. R. Mitchell, the Engineer of the works, had refused to see some of the railway men who had called in reference to the matter; but that perhaps he would be capable of being taught his place. Another speaker at the same meeting, the Secretary of the Leith Seamen and Firemen's Union, said he would make it part of his duty to see what could be done in the matter of the Edinburgh gas-works incident. They had a great number—he thought a majority of their firemen—among the gas stokers. He was prepared to say that all the men belonging to the Union would not be there much longer. He was quite confident that if he were to wire to the Executive to recall these men, they would do their best in order to assist the railway men as far as possible. These are the utterances of the leaders of the men; and though they are not borne out by the facts, they serve their purpose of screwing-up the determination of the men. Mr. Mitchell, when interviewed on the subject, said that the engine-driver and fireman made no objection when they were asked to conduct the train over the main-line, and that he never threatened them with dismissal.

The supply of coal to the gas-works in Edinburgh has been a subject of anxiety since my last "Notes" were written. Although relief was obtained at the end of last week from the pressing need which then existed, the stock did not accumulate. At the present time the daily consumption of coal is something like 440 tons, or about four train loads, and a couple of trains every other day, even with the aid of carts, could not do much more than keep up daily supplies. So threatening, indeed, did the situation appear that on Monday the pressure of the gas was reduced all over the city, the announcement of which, I may say in passing, has led to quite a crop of complaints as to insufficient light. On the same day Mr. Mitchell wrote to the Corporation, suggesting that they might assist in keeping up the gas supply by directing half of the public lamps to be extinguished at midnight. The Cleaning and Lighting Committee of the Town Council met on Tuesday to consider Mr. Mitchell's application. But before then it was seen that there was a reasonable probability of the gas supply being maintained; and on this being communicated to the Committee by Mr. Mitchell, they resolved not to do anything in the matter. The Commissioners purchased a cargo of 1200 tons of coal, which they conveyed into Leith and carted to Edinburgh. They also brought pressure to bear on the North British Railway authorities, and were able to arrange for the conveyance of coal trains from Granton and other places. The Commissioners were fortunate in being able to purchase a large lot of high-class cannel in the west, which is as great a help to them at present as anything they could have done. As many as 89 carts have been employed in one day carrying coal from Leith and Granton; and gas managers will understand what a serious matter this was for Mr. Mitchell. The Edinburgh works are so crowded that only one cart can get within the gate at a time; and in order to keep them going it was necessary that a cart should be tilted every few minutes, which did not leave much time for piling the coal up. It will be apparent from all this that the Commissioners' account for coal must now be greatly above their estimate for the current year. There is no mention of want of coal at the Leith works. At Stirling there is also no scarcity; a cargo having been procured by river. At Forfar the railway men have mostly remained at work; but on account of the difficulties at other parts of the lines, the coal supply at the gas-works is very limited. Alyth, a small town in Perthshire, was worse situated, because there the coal supply was all but exhausted, and the lighting of the street lamps had been given up, when the Blairgowrie Gas Company came to their aid, and lent them a sufficient supply for the time being. The Arbroath Gas-Works have never been badly off. There is yet nearly a week's supply of coal unexhausted from the stock in hand before the strike began; and Mr. Carlow has arranged for supplies both by rail and sea, which will give him a six weeks' supply. At Melrose there is a fortnight's supply of

coal; but residuals cannot be carried away, and the tar which is produced is being burned—there being no means of storing it.

The Edinburgh and Leith Gas Commissioners met on Monday, to consider their attitude towards the Provisional Order of the application for which notice has been given by the Corporation of Edinburgh. Bailie Archibald explained the view of the Special Committee to be that Parliament, having granted power to corporations to procure Provisional Orders, they, as the Gas Commission, were not entitled to oppose the general principle; and that, in fact, they could only oppose to the extent of having a clause inserted for the protection of their plant. The Committee proposed a clause to that effect. There was a long and unseemly wrangle over the minute of this Committee meeting. Mr. Macnaughton asserted that it was not accurate; but he received no support, and the minute was adopted. At the close of the public meeting, the Works Committee met to consider a question connected with the checking of meters; and it is reported that Mr. Macnaughton again showed a desire to find fault with Bailie Archibald's action, and, not succeeding, he left the meeting. Next day he sent in the resignation of his seat at the Gas Commission.

Mr. Jas. Colston, the chief mover in the Edinburgh Gas-Works transfer, who was defeated at the last municipal election, by Mr. Henderson, has been this week declared by the Sheriff to have been duly elected; Mr. Henderson being unseated on the ground of corruption on the part of some of his supporters. Mr. Colston will therefore take his seat again in the Gas Commissioners; and I am sure everyone will welcome him back again.

In connection with the proposal of the North British Railway Company to acquire the site of the Edinburgh Gas-Works for the extension of their Waverley station, a conference was held on Wednesday between a Committee of Gas Commissioners and the Lord Provost's Committee of the Corporation, at which it was resolved to oppose the Bill of the Railway Company to the extent of securing the insertion of a provision in the measure making it certain that the Railway Company shall purchase the gas-works by agreement, and not by arbitration.

The Leslie Police Commissioners recently intimated to the Gas and Water Companies, that they will require them to pay £5 each annually for the use of the burgh roads and streets in laying down their service-pipes; but the Companies have refused to do so, and the Commissioners have prohibited them from interfering with the streets in future without permission.

Mr. A. Slassor, who has for 28 years been Assistant Superintendent at the Aberdeen Gas-Works—eight years in the service of the Aberdeen Gas Company, and the remainder of the time under the Corporation—died on Thursday last. Mr. Slassor was a highly appreciated public servant.

From our Glasgow Correspondent.

GLASGOW, *Saturday*.

At the statutory quarterly meeting of the Dumfries Town Council sitting last Monday as the Gas Commission, there was submitted a very satisfactory statement from the Gas Committee. The Convener and Sub-Convener had been entrusted to transact urgent business in connection with the delay in getting coals from two contractors. As a matter of urgency they had authorized the purchase of 250 tons of shale at 14s. 6d. per ton, delivered at Dumfries; and the Manager (Mr. Malam) had been empowered to purchase such an amount of coal as he thought proper from a Dumfriesshire colliery at 13s. per ton. When Provost Scott, Convener of the Gas Committee, moved the adoption of the minutes, he said it had been calculated that when the new retorts were got into use, they would produce a considerable amount more coke than they were in the habit of getting formerly. The coke sold from May 15 till Dec. 31, 1890, had realized £568 0s. 8d., as compared with £284 16s. 4d. which was received in the corresponding period of 1889. There was thus an increase of £283 4s. 4d. For the whole year the amount allowed in the estimate was £700; and if only the same sum was realized from Jan. 1 till May 15, 1891, as for the corresponding portion of last year (£231), the year's sales would reach £799, or £99 over the estimate. The amount of gas that had been made from May 15 till Dec. 31, 1890, was 33,419,800 cubic feet, compared with 31,610,100 feet for the same period of the previous year, an increase of 1,809,700 feet—at 3s. 6d. per 1000 feet, equal to £316 14s. The amount of coal used in 1890 (May 15—Dec. 31) was 3289 tons, as compared with 3102 tons in 1889; representing, at 16s. 10d. per ton, an increased cost of £157 7s. 10d. There was thus a net profit of £159 6s. 2d. The prospective increase over the estimate for the year ending May 15 next was: Gas, £106; coke, £100; tar and liquor, £30; total, £290. This, the Provost remarked, spoke volumes for the management of Mr. Malam and the Committee who had gone down to the works so regularly and saw what was going on. The works were in excellent condition in every way; and he had no doubt that the Gas Commission would have a good balance on the right side this year. He could assure them that during the strike of the Glasgow and South-Western Railway Company's men, things were often rather alarming, as in December they had sometimes only six days' supply of coal in stock. Mr. Currie said that the report which had been submitted to the Commission was the most satisfactory one they had received for a considerable time, more particularly if they took into account the serious condition of the coal trade. It was well that the Manager and the Committee had been able to tide over the whole of the strike, with, he believed, the assistance of the Provost. The shale would increase the illuminating power of the gas to a great extent, but they would not get any coke from it; otherwise their savings at May 15 next would have been much larger. Bailie Dykes said that he had felt a considerable amount of alarm when he saw in the papers that if the strike went on, the town would be in darkness in a few days; and he thought it showed remissness on the part of the Committee that they were so near it. In such a case as that it was, he said, the duty of the Convener to call a meeting of the Committee to consider the matter. If the strike had turned out to be as serious as it at one time appeared to be, they would have been in a nice fix. The Provost replied that the Manager and himself were daily in communication, and that they watched the progress of affairs most closely; so that there never was any fear of an actual want of coal.

There is still a great amount of dissatisfaction in the Falkirk Town Council in regard to the impure quality and the illuminating power of the gas supplied to the town by the local Gas Company; and in reference to this matter some strong things were said by several members of the Council at the monthly meeting of that body held last Monday. The Secretary of the Gas Company has officially communicated with the Council on the allegation as to impure gas, which, he says, was due partly to an accident, and partly to the purifiers not working properly; while as to the illuminating power of the gas, he states that it will compare favourably with that of any other town in Scotland. Two or three members spoke at the meeting of the Council in favour of the gas being examined by a chemical expert; and the suggestion was agreed to. There seemed to be a feeling in favour of the gas supply being in the hands of the municipal authorities; and certainly there is no disposition on their part to cease pressing on the Gas Company with all the power that the law arms them with, which at best, however, is not very great.

A report by Mr. M'Cubbin, Manager of the Port-Glasgow Corporation Gas-Works, was presented to the Town Council last Monday evening, in which he stated that his make of gas during December was 3,878,200 cubic feet, as compared with 3,637,900 feet in the corresponding month of last year; thus showing an increase of 240,300 feet. The total make of gas for the year up till the end of December was 14,516,490 feet, against 15,268,000 feet in the corresponding period of 1889. Over the month the average illuminating power was 24 standard candles; the minimum being 22 candles, and the maximum 27 candles. Mr. M'Cubbin says that in the latter part of December he experienced great difficulty in keeping up the illuminating power of the gas to the standard at which it should be, as the supplies of cannel coal were seriously hindered by the railway strike; and consequently the make of tar and ammoniacal liquor was also seriously diminished.

The past week's Glasgow pig-iron market has been strong almost continuously from the opening on Monday. The price of Scotch warrants rose on Tuesday to 48s. 1½d. per ton cash, at or near which large transactions took place privately; whereupon the price dropped to 46s. 11d., from which there was a recovery, according to the needs of the "bears," to 47s. 11d. The close yesterday afternoon was 47s. 2½d. per ton cash. Only a small amount of business, however, was done; the market being somewhat quieter. There were rumours afloat to the effect that some of the blast furnaces which are usually devoted to the production of special brands of makers' iron would be blown in again as soon as the railway strike ends; and there were hints that foreigners were being brought over to this country to take the place of the furnacemen who have now been out on strike for about three and a half months; These had a depressing influence. It is actually stated that on Thursday there were between 50 and 100 Poles in Coatbridge; but they have since left the town. Otherwise there are not any signs of the dispute coming to a termination. Yesterday, when the strikers received their weekly aliment, they were told by Mr. Vickers, the agent of the Blastfurnacemen's Association, that there had been sent by that body some £8000 or £9000 to support the strikers in Scotland, and that they were not yet tired of sending the aliment. Personally, however, he would willingly come to any reasonable settlement the ironmasters might agree to make through an independent or judicial arbiter.

There is still a complete paralysis of the coal trade owing to the railway strike. Where there is any large output of coal in progress, coalmasters can only get the railway companies' officials to guarantee the use of mineral locomotives on being assured that complete and full-loaded trains are waiting ready-marshalled; and even then in many instances colliery managers and other persons not in the railway service have to lend a hand either as drivers or stokers of the engines. In most cases the supplies of coal in the consuming centres of industry and population are either practically *nil* or very irregular—a condition of things which is largely due to the fact that empty coal waggons cannot be got, as so many loaded ones are standing in the sidings waiting, but in vain, to be moved forward. As regards prices, it is scarcely possible to give exact quotations. Coalmasters and merchants are generally getting whatever they like to ask.

Ammonia Water as a Fire Extinguisher.—Considerable alarm was occasioned at Queensferry, near Hawarden, last Friday evening, by a serious explosion and fire at the works of Messrs. J. Turner and Co., chemical manufacturers and tar distillers. About half-past five a still charged with anthracene oil, 10 tons in quantity, exploded with terrific force, owing to the choking of the worm, and shot a volume of flame skywards that illuminated the district over a wide area, and was visible 10 miles off. The burning oil scattered itself over the yard and to the pitch house adjoining, where hundreds of tons of pitch were stored. The pitch ignited, and the conflagration assumed alarming proportions. Luckily, all the day men had just left the works; but three who had been left were burned—two so seriously that they had to be driven to the Chester Infirmary. Thousands of persons flocked to the scene. The Sandycroft Fire Brigade was promptly on the spot; and, by using ammonia water from a 50,000 gallon tank, they subdued the fire in an hour and a half.

The Eastbourne Gas Company and the Recovery of Gas and Meter Rental.—At the Lewes County Court last Tuesday, an action was entered for hearing in which the Eastbourne Gas Company claimed of Margaret Mortis the sum of £49 1s. 8d. for gas and meter-rent. At the outset, it was pointed out on behalf of the defendant that the Secretary of the Company (Mr. J. H. Campion Coles) was one of the Registrars of the Court; the letters claiming the money due were written by that gentleman; the matter was doubtless put into the hands of solicitors by him; and the affidavits were made by him. Sections 41 and 42 of the County Courts Act were quoted. The latter enacted that where an action was brought by an officer in a Court in which he was an officer (except as official receiver), the Judge should, at the request of the defendant, order that the venue be changed, and that the action be sent for trial at some convenient district at which he was not the Judge. After a long argument, His Honour Judge Martineau said he was satisfied that this was an action which could be more conveniently and fairly tried in some other Court; and he should transfer it to Croydon.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 17.

Sulphate of Ammonia.—A considerable business has been done, principally at £10 12s. 6d.; but the return of the frost seems to have placed a check upon further improvement. The steadier tone of the market generally indicates the healthy position of this commodity, occurring as it does in the face of adverse climatic influences; and the advent of milder weather would, therefore, warrant a better state of things. There is a good inquiry generally; and parcels are none too plentiful. Nitrate, too, is moving slightly upwards; and 7s. 10½d. is now spot value.

LONDON, *Jan.* 17.

Tar Products.—There has been no large amount of business done in this market during the week; and prices remain practically the same as they were the previous week. Carbolic acid still continues in an improved condition; and it is to be hoped that the worst has been seen of this article. To-day's prices may be taken as follows: Tar, 30s. Pitch, London, 36s.; country, 34s. Benzol, 90 per cent., 4s. 8d.; 50 per cent., 3s. 6d. Toluol, 2s. Solvent naphtha, 1s. 9d. Crude naphtha, 1s. 8d. Creosote, 2¼d. Heavy oil, 3d. Crude carbolic, 60's, 1s. 6d. Cresol, 9d. Anthracene (30 per cent.), "A" quality, 1s. 4d.; "B" quality, 1s. 1d.

Sulphate of Ammonia.—This product unfortunately keeps weak; and low prices have been accepted by makers. Important business has been done at £10 10s. Ammoniacal liquor is quoted at 6s. to 7s., according to position and strength.

The Public Lighting of Camberwell.—At a meeting of the Camberwell Vestry last Wednesday, a report was presented from the General Purposes Committee, recommending "that the attention of the London County Council be called to the quality of the gas supplied by the South Metropolitan Gas Company;" and, further, "that the attention of the Gas Company be called to the number of lamps that have remained unlighted during the past six weeks, and that, in consideration of the large loss of gas incurred by the Parish, the Company be asked to allow a rebate of £400 on the account for the current quarter."

An Employee of the Devonport Water Company Drowned.—An inquiry into the circumstances attending the death of William Curtis, 56 years of age, an employee of the Devonport Water Company, who was found drowned last Friday week in one of the Company's water-tanks, was held by the Borough Coroner, on the following day. From the evidence it appeared that deceased went to the Granby Green tank for the purpose of gauging the water, and that while doing this, he must have lost his balance, and fell into the tank. It was stated that he had previously complained to his wife of giddiness. The jury returned a verdict of "Accidental death."

Why the Gas is Bad.—Under this heading a Norwood newspaper last Saturday published the following letter, written by Mr. Magnus Ohren, the Secretary of the Crystal Palace District Gas Company, in reply to one from a resident in Beckenham, complaining as to the quality of the gas supplied to him: "Dear Sir—You say, 'Never, during the 20 years I have lived in Beckenham, have I known the gas so bad.' May I add that during the last twenty years I have not known the weather so bad. Gas companies were not prepared for a Russian winter, and have all suffered in consequence. We sent out on Christmas Eve one-third more gas than the corresponding night of 1889; and we have been put to great expense in providing gas for this enormous, unexpected, and sudden increase of consumption; and, to add to our trouble, in very cold weather the gas condenses and becomes frozen, gradually stopping the pipes and checking the supply, and, to some extent, affecting the quality of the gas. But, by the large use of rich cannel coal, the Engineer has been able to keep the gas up to our parliamentary standard. Having sent out last quarter so much more gas than the previous year, we naturally hope to find some of it registered upon the consumers' meters."

The Cost of the Cardiff Corporation Taff Fawr Water-Works.—The members of the Cardiff County Council had their attention called to this matter by Mr. Trounce yesterday week. After speaking of the delay which is taking place in the construction of the reservoirs in the Taff Fawr Valley, he went on to state that the estimates of the Water Engineer (Mr. Williams) for these works amounted to £213,882, in addition to which there was £71,423, the estimated cost of the Llanishen storeage reservoir, with the necessary mains. Mr. Batemen was called in; and he estimated the cost at £380,000, a part of which outlay, however, might, he said, be postponed for some years. An Act was obtained on the recommendation of Mr. Williams and Mr. Bateman, the latter of whom received in fees £1100. Comparing the estimates with the actual expenditure up to the present time, the Taff Fawr source of supply, with contingent works, had already cost £422,429; and he asked whether it was a fact that Mr. Williams had been paid during the last five years a sum of £12,915 for commission, or £14,463 for commission, salary, and preparing plans. The Chairman of the Water-Works Committee (Mr. Alderman Jones) replied that the gross amount which Mr. Williams had received was £14,291 for commission. Out of this he had paid £8426 for office expenses, assistants, inspectors, &c., from the commencement of the works in 1884 to December last. His estimated further expense for the completion of the works—say, 18 months—was £775, or in all £9201. The estimated further commission would be £1440; giving gross receipts of £15,731, and leaving a surplus to Mr. Williams for nearly seven years' service of £6559. He (Alderman Jones) did not think this extravagant. The total cost of the works was £351,846; and the parliamentary estimate of this portion of the undertaking was £240,749—leaving an excess of £121,000. Up to the present time the excess was £83,593. He attributed the delay in making progress with the works to the unfavourable climatic conditions of the watershed; it being impossible to keep men long on the work. A proposition was agreed to instructing the Borough Treasurer to prepare a full statement of all sums paid to the Engineer at 4 per cent. on the outlay since the commencement of the water-works contracts at Llanishen and Cefn.

The Finances of the Belfast Water Trust.—The annual general meeting of the water ratepayers of Belfast has been held; and a very satisfactory statement as to the progress which the Water Board have made was placed before them. In 1882 the gross receipts for the domestic rate were £14,102; in 1883, £14,391; in 1884, £14,672; in 1885, £15,845; in 1886, £16,741; in 1887, £17,259; in 1888, £17,743; in 1889, £18,902; and in 1890, £19,189. From 1880 until 1890 the water-rate has been almost continuously 10d. in the pound; and the receipts have risen from £10,666 to £19,189.

Water Gas Lighting for Barnard Castle.—A lecture on the subject of water gas was delivered in the Music Hall at Barnard Castle, by Mr. F. Scudder, F.C.S., last Friday week. The Local Board are proposing to adopt the light as a public illuminant; and the lecture was arranged for the purpose of demonstrating the "merits" of the gas. Mr. Scudder informed his audience that, from a ton of coke, 23,500 cubic feet of gas could be obtained at a cost of 6d. per 1000 feet; and that one foot would produce a light equal to 5 sperm candles. He also held that the light was steadier than that produced by coal gas.

The Brunswick (Melbourne) Gas-Works.—In the JOURNAL for July 15 last, we gave some particulars of the works which were then in course of erection by the Brunswick Gas Company for the supply of gas in that town, which is a suburb of Melbourne,. The works had been designed by Mr. S. S. Hutchison, C.E., who retained Mr. J. Chamberlain, M. Inst. M.E., formerly of Beckton, and subsequently with the Melbourne Gas Company, to supervise their construction. It was expected that the plant, some of which was being made in the locality, would be ready by last month; but we learn that, owing to the Company being unable to raise the full amount of capital necessary to complete the works and mains on the scale originally intended, it was decided to finish temporarily sufficient for the lighting of the public lamps of Brunswick within the extended time allowed by the Town Council. It is to be presumed, however, that, as the advantages of gas become fully appreciated by the townspeople, they will see the advisability of assisting the Company in their efforts to afford them an adequate supply.

The Electric Light at Taunton.—On the evening of Sunday, the 11th inst., the whole of the public electric lamps at Taunton went out about ten minutes after they were lighted, and remained out for an hour—from 5.15 to 6.20 p.m. As this was the time when the inhabitants were on their way to the various places of worship, great inconvenience was necessarily experienced, inasmuch as, the shops being closed, there was no light whatever in the streets. Consequently, complaints were loud and general. The matter was referred to at the meeting of the Town Council last Tuesday; one member remarking on the danger ensuing to the public owing to the state of the public thoroughfares at the time of the occurrence. It seems that scarcely a night passes without one or more of the electric lamps going out. This, perhaps, is not surprising, in view of the tricks which the electric light is known to play; but what would be said if gas were the delinquent? An accidental extinction in a single street once in ten years would form a subject of complaint in the Town Council for another ten; and prominence would be given to the fact in the reports. But with the electric light failures things are different; they are dealt with as leniently as possible.

Public Lighting Difficulties in Inclement Weather.—It is not often that the public have to be advised to take precautions against possible troubles owing to the want of gaslight in the streets, seeing that, under ordinary circumstances, this illuminant is generally available. We presume, however, that the excessively severe weather we have lately had may justly be regarded as extraordinary; and therefore it was perhaps judicious on the part of the Uxbridge District Local Board to publicly notify to the townspeople that, in consequence of the severe weather, several of the lamps within their district could not be lighted, and recommending persons having occasion to be about the streets and roads after dark to carry lanterns or other means of enabling them to obtain light, and thus avoid accidents. During the recent severe weather, Maidstone suffered greatly from the freezing of the gas-pipes; and one morning, when the lamplighters went round to extinguish the lights, 258 were found already out—the pipes being thickly frozen over. At the meeting of the Gravesend Town Council last Wednesday, the Town Clerk reported that he had been in communication with the Gas Company with respect to the large number of lamps which had been unlighted as a result of the frost. The Chairman of the Company (Mr. Troughton) said that, while they did not admit anything like legal responsibility in the matter, they were prepared to deal in an equitable spirit in the question of making a reduction. It was decided to engage an expert to inquire into the cause of the inconvenience, in the event of a recurrence of the trouble.

The Electric Lighting Scheme of the Stafford Corporation.—Our readers may remember that the Corporation of Stafford have obtained a Provisional Order enabling them to supply electricity for lighting and other purposes. Being desirous of ascertaining the probable demand before taking steps to avail themselves of their powers, the Electric Lighting Committee last week sent circulars to all likely consumers within their area, requesting them to state, before the 31st inst., if they wish to have a supply of electricity for lighting purposes, the kind of premises to be served, the number of lights, and whether the supply is to be under contract or by measurement. The Committee have fixed the price for electrical energy at 7d. per Board of Trade unit if the supply is by meter, or 40s. per annum for each 16-candle power incandescent lamp if by contract, which the Committee now recommend, except in special cases where a large number of lights are required. The Committee put the equivalent price of gas at 5s. 10d. per 1000 cubic feet; but this seems, even according to electricians' calculations, rather too low. It is estimated that the cost of supplying and fixing the necessary inside wiring, internal fittings, and lamp will be about £1 5s. per light; but the figure will vary according to the number and decorative nature of the fittings adopted. This expense the consumer will, of course, be required to bear. The service supply on public ground will, as in the case of gas, be put in free; but where consumers prefer to pay by measurement, they will be required to provide their own meter. The electric lighting service is under the direction of Mr. J. Ferguson Bell, the Gas Engineer of the Corporation.

The Oil Lighting at Erith.—Since last October, the contractors for the oil lighting at Erith have incurred fines amounting to £80 in consequence of lamps not being lighted in accordance with the contract.

Loughborough in Darkness.—Early last Saturday morning an accident occurred at the Loughborough Gas-Works, which caused the extinction of all the lights, and left the town in darkness. It appears that ammoniacal liquor overflowed from its tank into the gas outlet-pipe, and stopped the supply. The factories in the town were unable to resume work until daylight on Saturday.

Gas and Water Bills in Parliament.—Last Friday the time expired for the presentation, at the Private Bill Office of the House of Commons, of memorials complaining of non-compliance with Standing Orders in the case of Private Bills deposited. There is only one memorial in respect of a Bill relating to the supply of gas or water—that presented by the Lynton Local Board against the Lynton Water Bill.

Fylde Water Company.—A special meeting of this Company was held last Wednesday, when it was resolved to augment the capital by the issue of £20,000 consolidated "B" stock. On the same occasion the Bill now being promoted by the Company was considered and approved. The several townships affected by the Bill are taking steps to oppose the measure, unless certain clauses are altered.

Reduction in Price.—At the meeting of the Adlington (Lancs.) Local Board last Wednesday, the price of gas was reduced 3d. per 1000 cubic feet to consumers of less than 175,000 cubic feet yearly; the price now being as follows: Under 175,000 feet per annum, 4s. 5d. per 1000 cubic feet; between 75,000 and 175,000 feet per annum, 4s. 2d., less 5d. per 1000 feet if the account is paid within three weeks after delivery.

Deaths from Electricity.—Last Sunday week a boy at Lyndeburg, Virginia, caught hold of a guy-wire attached to an electric light pole, and, receiving a severe shock, was killed instantly. On the previous day a workman at Boston, while engaged in replacing the globe of an incandescent light, took hold of the metal ring instead of the glass end. The man received a strong electric shock, which killed him on the spot. The connecting wire had to be cut before the ring could be detached from his grasp.

The Charge of Shooting at a Gas-Works Foreman.—At the Central Criminal Court last Friday, before Mr. Justice A. L. Smith, Henry Attwell, 35, was indicted with shooting with a revolver at Robert Burn, a foreman in the service of the Commercial Gas Company, with intent to murder him. The facts of the case have been so recently recorded (see *ante*, p. 25), as to be fresh in the recollection of our readers. Prisoner, in defence, said he had no intention of hurting the prosecutor; but merely wished to frighten him. The jury acquitted the prisoner of the charge of shooting with intent to murder; but found him guilty of shooting with intent to do grievous bodily harm. He was sentenced to five years' penal servitude.

Electric v. Gas Lighting in Madrid.—Writing on this subject on the 5th inst., the Madrid correspondent of *Industries* said: "The palace of Las Cortes is to be electrically lighted by means of a separate installation; but the lighting of the House of the Senate will be supplied by one of the central stations. Every day some fresh establishments are adopting the use of incandescent lamps; while others which adopted the system a month ago have gone back to the use of gas. This action on the part of customers appears to be justified, as the companies are charging the excessive price of 1s. 3d. per unit, and make their customers pay double or treble the fair price for the fittings. This will probably cause the adoption of small installations with 500 to 1000 lamps, which will be of a suitable size for the lighting of the blocks of buildings let out in flats."

The Sunderland Gas and Water Companies and Electric Lighting.—At a meeting last Tuesday of the Electric Lighting Committee of the Sunderland Town Council, the Town Clerk submitted a list of suggested amendments from the Sunderland Gas Company and the Sunderland and South Shields Water Company to the Bill which the Corporation are promoting for empowering them to supply electricity in the town. He stated that he had sent the amendments to the London Agents of the Corporation who drew the Bill. Their reply was that they could not advise the Corporation to concede the amendments, inasmuch as, when the Electric Lighting Bill was before the Board of Trade last session, gas and water companies throughout the country were allowed to send in objections and amendments, which were all duly considered. A deputation from the Gas and Water Companies having been admitted, the Town Clerk drafted a resolution to the effect that the Corporation as a public authority would agree to protect as far as they could the interests of all parties concerned; and that, if the deputation could induce the Board of Trade to accept their suggested amendments to the Bill, the Corporation would not feel called upon to oppose them. This was adopted.

The Fatality at the Wortley Gas-Works of the Leeds Corporation.—An adjourned inquiry into the circumstances attending the death of Edward Garside (44), an engine-driver, who was killed at the Wortley gas-works of the Leeds Corporation, on the 23rd ult., was held last Tuesday by the Borough Coroner (Mr. J. C. Malcolm). On the morning of the day in question, it will be remembered, the deceased was driving an engine in the works, when by some means or other the locomotive ran on to a siding, instead of proceeding forward as was intended, and collided with some waggons, with the result that Garside was crushed in a portion of the engine, and scalded to death before he could be extricated. The really important question that arose in connection with the fatality was by whose fault, if by anyone's, the points came to be left open, or by what other oversight the engine got on to the siding. The duty of having these points in order rested, it appears, with the workman who was acting as shunter to the deceased. In his evidence the shunter (Frederick Walker) said that he was confident he had set the points in their proper position shortly before the engine reached them, and that he could not explain how they could have got deranged or open for the siding. The jury returned a verdict of "Accidental death." In their opinion there was no blame attached to anyone; the fatality having occurred through the fog which prevailed on the morning in question, and on account of which the workmen had not been able to see the points.

The Burnley Corporation Coal Contracts.—In moving the adoption of the minutes of the Gas Committee at the last meeting of the Burnley Town Council, Alderman Collinge, the Chairman, said the Executors of Colonel Hargreaves had made application to the Committee for the present market price to be paid for the coal required for the lighting of the extended portion of the borough. He explained that the contract under which the Corporation were now supplied was made three years and a half ago, before the extension of the boundary took place; and it would run for another twelve months. It was an exceptionally favourable one; being 10s. per ton, whereas the present price was 14s. per ton. Consequently, the Corporation had been saving, and would continue to save, about £8000 a year on it. The Committee had decided to meet the Executors in a fair way, and would pay 14s. per ton for the coal required for the lighting of one part of the district; the claim for the rest of the added area having been abandoned. The minutes were approved.

Strike at the Rockingham Gas and Chemical Works.—A strike of the men employed at these works has taken place. The works are the property of Messrs. Newton, Chambers, & Co., of the Thorncliffe Iron-Works, near Sheffield; but gas is not made at them for lighting purposes, but only for obtaining bye-products. Towards the end of December Messrs. Newton, Chambers, and Co. let the work by contract; and on the 2nd inst., they gave fourteen days' notice to the stokers and others to terminate their engagements. These notices expired last Friday; and when the men commenced to make arrangements with the contractor, Mr. Wright, they found that so much extra work was required from them, without any extra pay, that they refused in a body to proceed with their work. It seems that Mr. Wright had anticipated what would be the result of the propositions; for on the previous Monday, the Manager of his Cottingham Gas-Works, near Hull, had arranged with a number of men from that district to proceed to Birdwell and take the places of the old hands. These men arrived on Friday, Saturday, and Sunday morning. Those arriving on Friday and Saturday were persuaded by the old hands to return. On Sunday morning a public meeting was held near the works, at which several men from Sheffield spoke. The remainder of the Hull men were then induced to come out.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 106.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	10 Oct.	10½	Alliance & Dublin 10 p. c.	10	16–17	..	6 3 6
100,000	10	„	7½	Do. 7 p. c.	10	12–13	..	5 15 6
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	105–107	..	4 13 5
100,000	20	27 Nov.	8	Bahia, Limited	20	16–18	–1	8 17 10
200,000	5	13 Nov.	7½	Bombay, Limited	5	6¾–7¼	..	5 3 5
40,000	5	„	7½	Do. New	4	5–5⅛	..	5 9 1
380,000	Stck.	14 Aug.	12½	Brentford Consolidated	100	212–217	..	5 12 11
125,000	„	„	9½	Do. New	100	155–160	..	5 15 7
220,000	20	11 Sept.	11½	Brighton & Hove Original	20	40–42	..	5 9 6
320,000	20	28 Mar.	11½	British.	20	43–45	..	5 0 0
50,000	10	11 Sept.	11	Bromley, Ordinary 10 p. c.	10	18–20	..	5 10 0
39,000	10	„	8	Do. 7 p. c.	10	13–14	..	5 14 3
328,750	10	13 Nov.	6	Buenos Ayres (New) Limited	10	11–12	..	5 0 0
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	101–104	..	5 15 6
150,000	20	14 Aug.	8	Cagliari, Limited	20	26–28	..	5 14 3
550,000	Stck.	10 Oct.	13¾	Commercial, Old Stock	100	250–254	..	5 8 3
130,000	„	„	10¼	Do. New do.	100	198–203	..	5 5 11
130,000	„	30 Dec.	4½	Do. 4½ p. c. Deb. do.	100	117–122	..	3 13 9
557,320	20	30 Dec.	13	Continental Union, Limited	20	47–49	..	5 6 2
242,689	20	„	13	Do. New '69 & '72	14	32½–33½	..	5 8 5
200,000	20	„	10	Do. 7 p. c. Perf.	20	37–39	..	5 2 6
75,000	Stck.	25 Sept.	10	Crystal Palace District	100	195–205	..	4 17 7
234,060	10	16 July	—	European, Limited	10	19–20	..	—
120,000	10	„	—	Do. New	10	19–20	..	—
354,060	10	„	—	Do. do.	7½	13½–14½	..	—
5,470,620	Stck.	14 Aug.	13	Gaslight & Coke, A, Ordinary	100	247–252	+3	5 3 2
100,000	„	„	4	Do. B, 4 p. c. max.	100	98–101	..	3 19 3
665,000	„	„	10	Do. C, D, & E, 10 p.c. Pf.	100	251–256	..	3 18 1
30,000	„	„	5	Do. F, 5 p. c. Prf.	100	120–125	..	4 0 0
60,000	„	„	7½	Do. G, 7½ p. c. do.	100	177–182	..	4 2 5
1,300,000	„	„	7	Do. H, 7 p. c. max.	100	164–168	..	4 3 4
463,000	„	„	10	Do. J, 10 p. c. Prf.	100	250–255	+2	3 18 5
176,000	„	—	—	Do. K, 6 p. c. Prf.	100	150–155	..	3 17 5
1,061,150	„	12 Dec.	4	Do. 4 p. c. Deb. Stk.	100	111–116	..	3 9 0
294,850	„	„	4½	Do. 4½ p. c. do.	100	121–126	..	3 11 5
650,000	Stck.	„	6	Do. 6 p. c. do.	100	162–166	+2	3 12 3
3,800,000	Stck.	13 Nov.	12	Imperial Continental	100	227–231	+2½	5 3 10
75,000	5	12 Dec.	6	Malta & Mediterranean, Ltd.	5	5–5⅛	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	110–113	+½	4 8 6
541,980	20	27 Nov.	7½	Monte Video, Limited	20	18½–19½	..	6 13 4
158,000	5	27 Nov.	10	Oriental, Limited	5	8¾–9¼	..	5 8 1
60,000	5	25 Sept.	7	Ottoman, Limited	5	5–5⅛	..	6 7 3
166,870	10	16 July	4	Pará Limited	10	3–4	..	10 0 0
420,000	100	3 Nov.	6	People's Gas of Chicago— 1st Mtg. Bds.	100	95–100	..	6 0 0
500,000	100	1 Dec.	16	2nd Do.	100	93–98	..	6 2 5
150,000	10	10 Oct.	10	San Paulo, Limited	10	15–17	..	5 17 8
500,000	Stck.	28 Aug.	13½	South Metropolitan, A Stock	100	282–287	+2	4 12 4
1,350,000	„	„	11½	Do. B do.	100	230–235	+2	4 17 10
141,500	„	„	2	Do. C do.	100	235–245	..	4 17 11
650,000	„	30 Dec.	5	Do. 5 p. c. Deb. Stk.	100	140–145	..	3 9 0
60,000	5	11 Sept.	11½	Tottenham & Edm'nton, Orig.	5	11–13	..	4 8 5
				WATER COMPANIES.				
729,221	Stck.	30 Dec.	10	Chelsea, Ordinary	100	267–272	..	3 13 6
1,720,560	Stck.	10 Oct.	7½	East London, Ordinary	100	215–220	+1	3 8 2
544,440	„	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	140–145	..	3 2 0
700,000	50	12 Dec.	9	Grand Junction	50	120–125	+3	3 12 0
708,000	Stck.	14 Aug.	10½	Kent	100	274–279	+1	3 15 3
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	248–253	+3	3 15 1
406,200	100	„	7½	Do. 7½ p. c. max.	100	195–200	..	3 15 0
260,000	Stck.	25 Sept.	4	Do. 4 p. c. Deb. Stk.	100	120–124	..	3 4 6
500,000	100	14 Aug.	12½	New River, New Shares	100	360–365	..	3 6 5
1,000,000	Stck.	31 July	4	Do. 4 p. c. Deb. Stk	100	125–128	..	3 2 6
902,300	Stck.	12 Dec.	7	S'thwk & V'xhall, 10 p. c. max.	100	175–180	..	3 17 9
126,500	100	„	7	Do. 7½ p. c. do.	100	167–172	..	4 1 4
1,155,066	Stck	12 Dec.	10	West Middlesex	100	263–268	+1	3 14 7

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON." TELEPHONE No. 2698.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

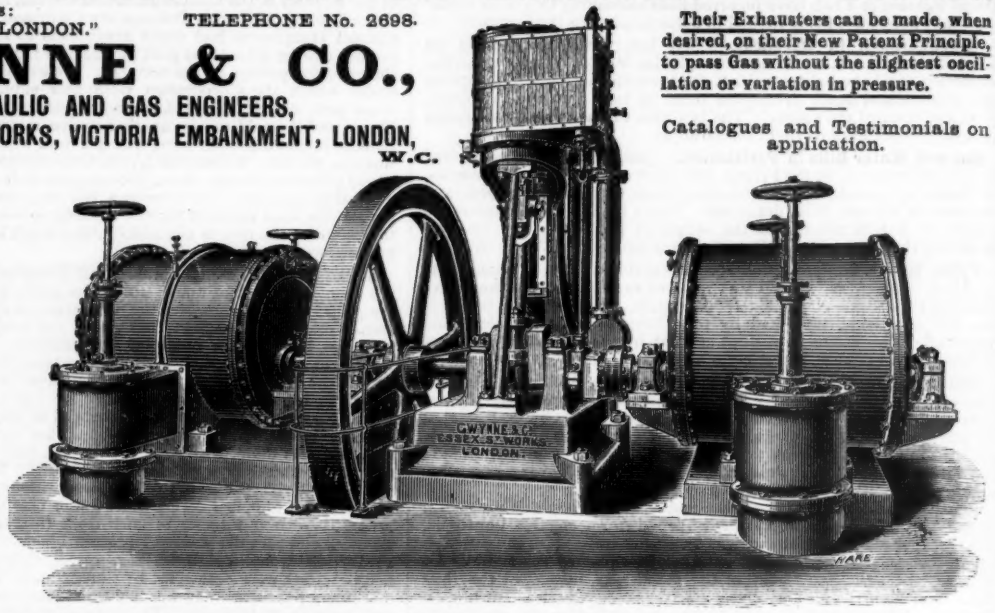
ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co. for Gas Exhausters, &c.

They have completed Exhausters to the extent of 29,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

Catalogues and Testimonials on application.

Exhausting Machinery at Fulham and Bromley Gas-Works—each set passing 400,000 cub. ft. per hour, drawing 14 miles distant from Beckton.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, GAS-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.

Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEAR DALKEITH, } SCOTLAND.

JOHN RILEY & SONS, Chemical Manufacturers, [illegible]apton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 85, Gracechurch Street, LONDON; 70, Wellington Street, GLASGOW; 58, Fountain Street, MANCHESTER; and 96, Reade Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

EXTRACT from the Harrogate Gas Company's Report, dated the 5th of February, 1890. Coal consumed, 8600 tons. Gas made, 92,880,000 feet; ditto sold, 84,890,000 feet; ditto unaccounted for, 8,000,000 feet; quantity made per ton, 10,800 feet; ditto sold, 9869 feet. Illuminating Power, 16·1 candles. Coals used, Brancepeth. Owners, Strakers and Love, Newcastle-on-Tyne; who have also Brandon Hutton Seam Unscreened Gas Coal. Analysis, 10,500 cubic feet per ton; Illuminating Power, 16·2 candles.

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 40.
Inquiries should be addressed to THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 86-88A, LEADENHALL STREET, E.C.

TAR and Liquor wanted.
BROTHERTON AND CO., Commercial Buildings, LEEDS.

WANTED, a Situation, by a practical Man conversant with Road Making, Sewering, Gas and Water Main Laying, &c., at home or abroad.
Address B. G., care of Crompton, Agent, Sale, CHESHIRE.

WANTED, immediately, a Gas-Meter INSPECTOR.
Address, stating age, and giving references, No. 1898, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisements pp. 127, 128 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

IRISH Bog Ore for Gas Purification. The very best imported. Sample Trucks sent from Depôt at Runcorn.
A. C. FRASER, Gas Engineer and Carbon Manufacturer, SALFORD.

WANTED, to purchase Gas Carbon delivered at nearest Station to Gas-Works, in quantities of not less than 4 tons.
Address, stating price per ton and quantity, No. 1766, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

DRAUGHTSMAN.
(TEMPORARY ENGAGEMENT.)

WANTED, by a Gas Company near London, a DRAUGHTSMAN experienced in Gas-Works Extensions.
Address No. 1896, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Working Manager for a small Gas-Works in Surrey. Competent to lay Services, and Fix Meters and Gas-Stoves. Good references required. Wages 20s. per week, and a Bonus on results; also Cottage, Coke, and Gas free.
Address No. 1897, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BANDON TOWN COMMISSIONERS (CO. CORK).

MANAGER FOR THE GAS-WORKS.

WANTED, a Competent Person for the above position. Salary, £80 a year, with House, Fuel, and Light, also Garden.
Applications, with copies of testimonials, to be lodged with the undersigned at or before Ten o'clock a.m. on Monday, Feb. 2, 1891.
By order,
JOHN M'DONNELL, Town Clerk.
Board-Room, Bandon,
Jan. 15, 1891.

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes, &c.
JOHN SPENCER, Globe Tube Works, WEDNESBURY, and 14, Great St. Thomas Apostle, LONDON.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Wet and Dry Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Lead Saturators, Tanks, &c., Tools and Sundries.

BENTLEY & CO.

MANCHESTER ELECTRICAL STORES.

FOR Batteries, Bells, Wires, and Special Electrical Apparatus, address the best house
17, NEWTON STREET, PICCADILLY, MANCHESTER.

WANTED, a steady Man as GAS-FITTER and MAIN and SERVICE LAYER. Must be able to do Smithing and General Repairs to Works and Tools.
Apply, stating age and wages required, to Mr. A. GRAHAM, Manager, Gas-Works, HEBDEN BRIDGE.

SHEFFIELD UNITED GASLIGHT COMPANY.

WORKS SUPERINTENDENT.

WANTED, by the Directors of this Company, an experienced and competent Man to act as SUPERINTENDENT at their Effingham Street Gas-Works. (The position is vacant owing to the present Superintendent having been promoted.) He will be required to reside on the Works, with House, Coal, and Gas free.
The maximum make of Gas at this Station is about 3½ million cubic feet per day.
Applications (marked "Superintendent"), stating age, previous engagements, and salary required, to be made by letter only, addressed to Sir Frederick T. Mappin, Bart., M.P., Chairman of the Company, Gas Offices, Sheffield, not later than Friday, Feb. 6, 1891. Testimonials not to be sent till asked for.
HANBURY THOMAS,
General Manager.
Commercial Street, Sheffield,
Jan. 15, 1891.

THE Sheffield United Gaslight Company require the services of an efficient DRAUGHTSMAN. One who has been connected with Gas-Works preferred.
Salary £120 per annum.
Applications (marked "Draughtsman"), stating age, previous experience, &c., to be sent to the undersigned not later than Friday, Feb. 6, 1891.
HANBURY THOMAS,
General Manager.
Commercial Street, Sheffield,
Jan. 15, 1891.

WANTED, by the Ross Gas Company, a thoroughly practical GAS-FITTER. Must be well up in Main and Service Laying, Stove and Meter Fixing, be able to do light Smith's Work, and willing to make himself generally useful.

Apply by letter, stating age, experience, and wages required, to the MANAGER.

COUNTY BOROUGH OF STOCKPORT.
(GAS DEPARTMENT.)

ENGINEER.

THE Gas Committee are prepared to receive APPLICATIONS from Persons qualified to fulfil the duties of GAS ENGINEER and MANAGER to this Department, and competent to design and superintend the carrying out of Extensions required from time to time.

The Engineer appointed will receive the assistance of an under Engineer.

Salary £400 per annum.

Applicants must possess a sound and practical knowledge of Gas Manufacture and Distribution, and also of the treatment of Residual Products.

Applications, stating age, present position, experience, with full particulars of past engagements, together with copies of testimonials, to be addressed to the Chairman of the Gas Committee, Gas Office, Stockport, endorsed "Engineer," on or before Twelve o'clock Noon on Monday, Feb. 2, 1891.

By order,
WALTER HYDE, Town Clerk.

Stockport, Jan. 15, 1891.

A New 24-inch Centre-Valve (dry-faced) to work One, Two, Three, or Four Purifiers; also strong wrought-iron CYLINDER, 6 ft. diameter by 30 ft. long, suitable for Scrubber, TO BE SOLD cheap.

Apply, by letter, to No. 1895, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ON SALE—Gas Coals and Nuts. Prompt Delivery.

Apply to the MADELEY COAL AND IRON COMPANY, LIMITED, Madeley, NORTH STAFFORDSHIRE.

FOR SALE—60 tons of 4-inch Turned and Bored PIPES in 9-feet lengths (1 cwt. 1 qr. 20 lbs.), second-hand, but in good order. Will be sold at a low rate.

Apply to WM. MACLEOD AND CO., 56, Robertson Street, GLASGOW.

LITTLEHAMPTON GAS COMPANY, LIMITED.

FOR SALE—In consequence of removal to new Works—

One Single Gasholder and Cast-Iron Tank, 40 feet diameter, 13ft. 6in. deep. Capacity, 14,000 feet.
Four Purifiers 7ft. 6in. by 5ft. 6in. by 3ft., with 6 inch Centre-Valve complete.
One Livesey Patent Washer; capacity, 100,000 feet per day; 6-inch Connections, and 6-inch Four-Way Valve.
Hydraulic Main, with Ascension and Bridge Pipes, and 23 Mouthpieces complete.
One 3-inch Liquor Pump, with Spur and Driving Wheels and Shafting complete.
One 6-inch Bye-Pass Valve.
One Donkey-Feed Pump; and one 6-inch Four-Way Valve.

The above Plant may be viewed by arrangement with Mr. W. Waite, Manager of the Works.

Tenders to be forwarded to the Chairman, Captain E. H. Hills, R.N., High Street, Littlehampton.

The Directors do not bind themselves to accept the highest or any tender.

ARTHUR SNEWIN, Secretary.

Jan. 10, 1891.

FIRE-CLAY RETORTS, ETC.

THE Buxton Local Board invite TENDERS for the supply of RETORTS, QUARRIES, BRICKS, CLAY, &c., for the coming season.

Tenders, endorsed, "Tender for Retorts, &c.," to be addressed to the Chairman of the Gas Committee, Town Hall, Buxton, not later than the 31st inst.

Forms of tender and other particulars may be obtained of Mr. G. Smedley, Gas Department, Town Hall, Buxton.

By order,
JOSIAH TAYLOR, Clerk.

Buxton, Jan. 8, 1891.

TO GASHOLDER MANUFACTURERS.

THE Gas Committee of the Bingley Improvement Commissioners invite First-Class Firms to TENDER for the RE-SHEETING and the IMPROVEMENT IN ITS CONSTRUCTION, of their No. 1 TELESCOPIC GASHOLDER.

Specification and form of tender to be had on application to the undersigned.

The Commissioners do not bind themselves to accept any tender.

By order,
GEORGE DUNBAR MALAM,
Engineer.

Gas-Works, Bingley,
Jan. 14, 1891.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

TENDERS FOR RETORTS AND FIRE-BRICKS.

THE Gas Committee invite Tenders for the supply of the RETORTS and FIRE-BRICKS required at their various Works.

Full particulars and form of tender may be obtained on application to the Gas Engineer, Gas Offices, Bloom Street, Salford.

Sealed tenders, endorsed "Tender for Fire-Clay Goods," addressed to the Chairman of the Gas Committee, to be sent to my Offices not later than Five p.m. on Thursday, the 29th inst.

By order,
SAMUEL BROWN, Town Clerk.

Town Hall, Salford.

CORPORATION OF BLACKPOOL.

IRON ROOF CONTRACT.

THE Gas Committee are prepared to receive TENDERS for the supply and erection of a WROUGHT-IRON ROOF, 218 ft. by 100 ft., single span, over their new Retort-House.

Tenders must be endorsed outside, and sent in addressed to the Chairman of the Gas Committee by the Morning of the 26th of January.

Plans, Specifications, and Detail Drawings may be seen at the Office of the undersigned.

By order,
JOHN CHEW, Gas Engineer.

Gas Office, Blackpool,
Jan. 14, 1891.

TO RETORT & FIRE-BRICK MANUFACTURERS.

THE Corporation of Birkenhead are prepared to receive TENDERS for RETORTS, FIRE-BRICKS, BLOCKS, and FIRE-CLAY required at their Gas-Works during the current Year.

Forms of tender may be obtained from Mr. T. O. Paterson, C.E., Gas Engineer, Gas-Works, Thomas Street.

Tenders, sealed, and endorsed "Tender for Retorts, &c.," to be sent in to me not later than Five o'clock in the afternoon of Friday, the 23rd of January, 1891.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,
ALFRED GILL, Town Clerk.

Town Hall, Birkenhead,
Jan. 12, 1891.

TO GASHOLDER MAKERS.

THE Gas Committee of the Corporation of Congleton invite TENDERS for the construction and erection of a GASHOLDER.

The drawings and specification may be seen at the Gas Offices, Congleton, and at the Office of Mr. Thomas Newbigging, C.E., 5, Norfolk Street, Manchester.

Copies of the bill of quantities and form of tender may be obtained from the latter on deposit of Two Guineas, which will be returned on receipt of a *bonâ fide* tender.

Sealed tenders, endorsed "Gasholder, Contract No. 2," to be addressed to me, and sent so as to reach me not later than Twelve o'clock noon on Tuesday, the 10th of February next.

The Corporation do not bind themselves to accept the lowest or any tender.

JOHN WILSON,
Town Clerk.

Congleton, Jan. 17, 1891.

TO GAS APPARATUS MAKERS.

THE Gas Committee of the Corporation of Congleton invite TENDERS for the construction and erection of a TOWER SCRUBBER.

The drawings and specification may be seen at the Gas Offices, Congleton, and at the Office of Mr. Thomas Newbigging, C.E., 5, Norfolk Street, Manchester.

Copies of the bill of quantities and form of tender may be obtained from the latter on deposit of Two Guineas, which will be returned on receipt of a *bonâ fide* tender.

Sealed tenders, endorsed "Tower Scrubber, Contract No. 3," to be addressed to me, and sent so as to reach me not later than Twelve o'clock noon on Tuesday, the 10th of February next.

The Corporation do not bind themselves to accept the lowest or any tender.

JOHN WILSON,
Town Clerk.

Congleton, Jan. 17, 1891.

CORPORATION OF LEICESTER.

CAST-IRON PIPE CONTRACT.

THE Gas Committee of the above Cor poration are prepared to receive TENDERS for the supply of the necessary CAST-IRON PIPES and CONNECTIONS, from 3 inches to 24 inches in diameter, required during the Twelve months ending the 31st of December, 1891.

Specification and form of tender to be obtained from the Engineer.

Tenders, addressed to Councillor Lennard, Chairman, and endorsed "Tender for Cast-Iron Pipes, &c.," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, Jan. 24, 1891, inst.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, M. Inst. C.E.,
Engineer and Manager.

Gas Offices, Millstone Lane,
Leicester, Jan. 12, 1891.

HARTLEPOOL GAS AND WATER COMPANY.

TO CONTRACTORS, ETC.

THE Directors of the above Company are prepared to receive TENDERS for the several Works and Materials required in the construction of a GASHOLDER TANK, 152 ft. 6 in. in diameter, and 30 ft. 6 in. deep, in Puddle Concrete, Brickwork, and Masonry, and the Erection and Completion of the same on their Land at West Hartlepool.

Plans and Specification may be seen, or any further information obtained, on application to the Company's Engineer, Mr. Thomas Bower, who, if desired, will supply copies of the plans.

Tenders on form prescribed, and sealed and endorsed "Tender for Gasholder Tank," to be sent to Mr. Thomas Trewhitt, Secretary, Gas and Water Company, West Hartlepool, not later than Wednesday, the 11th day of February next.

The Directors do not bind themselves to accept the lowest or any tender.

By order of the Directors,
THOMAS TREWHITT,
Secretary.

Gas and Water Company's Offices,
West Hartlepool, Jan. 10, 1891.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

MIRFIELD, NORMANTON.

NEWBATTLE CANNEL.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

CAST-IRON PIPES

FOR GAS AND WATER.

VALVES

FOR GAS, WATER, AND STEAM.

TELEGRAMS: "PIPES GLASGOW."

WM. MACLEOD & CO.,

56, ROBERTSON STREET, GLASGOW

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD

CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP

GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

For Prices and complete Analysis, apply to

YOUNG, DANCE, & CO.,

COAL OWNERS, NEWCASTLE-ON-TYNE.

Or E. FOSTER & CO., 21, John St. Adelphi, LONDON, W.C.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

COKE BREAKERS,
PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT.)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

GEORGE WALLER & CO.,
PARK STREET, SOUTHWARK, E.C.

PATENTS FOR INVENTIONS,
REGISTRATION OF TRADE MARKS and DESIGNS in all Countries.
SEARCHES made *re* novelty, and opinions given on all matters connected with above. *Full particulars on application to*
J. C. CHAPMAN,
Assoc.M.Inst.C.E., M.Inst.M.E., Fel. Inst. Patent Agents,
70, CHANCERY LANE, LONDON, W.C.
Special experience in Gas and Ammonia Plant.

ESTABLISHED 1872.
G. Coombe Stuart, F.C.S.
33, ELMFOOT STREET,
OFF RUTHENGLEN ROAD, S.S.,
GLASGOW.
PUBLIC ANALYST,
Consulting Chemist,
GAS EXAMINER, AND ASSAYER.
FEES MODERATE.

HOLMSIDE GAS COALS.
THE Owners of Holmside and South Moor Collieries possess an undivided area of nearly 5000 acres of COAL in the County of Durham, over the greater portion of which area the most of the best Coal of the district, including the well-known Hutton Seam, remains almost untouched; and as preparations are being made for working the Hutton Seam on a large scale, it is expected that the reputation of HOLMSIDE GAS COALS will be still further increased. The Holmside and South Moor Collieries have been in the hands of the same families for over half a century; but, until lately, no adequate attempt has been made to open out their very large Coal-Field, notwithstanding that the best Coal of the district around them, and especially the Hutton Seam, has been for some time past seriously diminished by reason of the vigorous workings of neighbouring coal-owners. Holmside Gas Coals are now being worked out of Holmside and South Moor Collieries at a rate of about 2200 tons per working day—a rate totally inadequate to meet the existing demand. By an extensive development of workings in the Hutton Seam, it is hoped that the demand may be fully met, and the quality raised to the highest point attainable by Durham Coal.
For price and particulars, apply to MARK ARCHER, Holmside and South Moor Offices, Quayside, NEWCASTLE-ON-TYNE.

Lanemark Coal Co.,
LIMITED.
LANEMARK CANNEL
AND GAS COALS.
Quotations and Analysis on application to
LANEMARK COLLIERY,
NEW CUMNOCK, N.B.
Shipping Ports: All the principal Scotch Ports.

For **FIRE-BRICKS,** the most durable for **GAS-FURNACES,**
ADDRESS
JAMES WHITE & Co.,
ALBERT WORKS, WIDNES.

SOOTHILL WOOD CANNEL.
Yield of Gas per Ton, over 12,000 Cubic Feet.
Illuminating Power - - - - - 26 Candles.
Coke per Ton, - - - - - - - 57 per cent. of a quality almost equal to that made from the best Coking Coal.
For Analysis and Price, apply to
The Soothill Wood Colliery Co., Ld.,
SOOTHILL WOOD COLLIERY,
BATLEY, YORKSHIRE.

THOMAS ILLINGWORTH,
NORTH DEAN CHEMICAL WORKS,
Near HALIFAX,
MANUFACTURER OF SULPHURIC ACID
OF EXTRA QUALITY FOR MAKING
WHITE SULPHATE OF AMMONIA.
TAR LIQUOR, AND SPENT OXIDE
Purchased for Cash against Delivery.

THE SILICA FIRE-BRICK COMPANY,
OUGHTIBRIDGE, near SHEFFIELD
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.
Trade Mark: "SILICA."
These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

C. & W. WALKER.

GASHOLDERS; PURIFIERS;
PURIFYING MACHINES;
CO_2 AND TAR-EXTRACTING WASHERS; SCRUBBERS;
SULPHATE & SULPHUR PLANT;
RETORT MOUTHPIECES; CONDENSERS;
LIFTING APPARATUS; CENTRE AND FOUR-WAY VALVES;
SLIDE VALVES; TAR BURNERS; &C., &C.
WOOD SIEVES.

ADDRESSES: 8, Finsbury Circus, London, E.C.; Midland Iron-Works Donnington, near Newport, Shropshire.
"FORTRESS LONDON." "FORTRESS DONNINGTON."—Telegraphic.

THOMAS TURTON AND SONS, LIMITED,
Sheaf & Spring Works,
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.
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PARIS DEPOT: 3, BOULEVARD DE BELLEVILLE.

THE BEST AND SIMPLEST SYSTEM OF
VALVES FOR PURIFIERS
Is Weck's Patent arrangement of Three-Way Disc Valves, either separate for Purifiers fixed in line, or arranged together as a
CENTRE-VALVE
When the Purifiers are fixed in square
No Leakage. No Foul Gas passed in changing. All the Purifiers in action, or any less number. Clean Box emptied of Air before taking into use.
DESCRIPTIVE PAMPHLET ON APPLICATION.
F. WECK,
JOHN BRIGHT ST., BIRMINGHAM.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter: and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

GAS COAL.
BEST REAL OLD SILKSTONE GAS COAL.
Address, THE STRAFFORD COLLIERIES COMPANY,
Near BARNSLEY, SOUTH YORKSHIRE.

W. C. HOLMES & CO., WHITESTONE IRON-WORKS, HUDDERSFIELD,
Makers of the
PATENT SCRUBBER-WASHER
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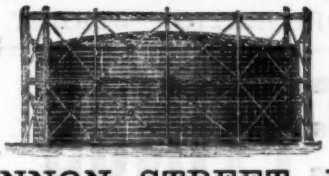
BROOK'S GAS PRODUCER.

GASHOLDERS, ALL SIZES,
PURIFIERS, SCRUBBERS,
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OF EVERY KIND.
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FIRE BRICKS,
LUMPS, TILES,
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Special Bricks for Intense Heats.
GAS RETORTS.
CASTINGS AND EVERY REQUISITE FOR GAS-WORKS.
MOBBERLEY & PERRY,
Fire-Brick Works, STOURBRIDGE.
Retort Setters sent to any part of the Kingdom.

SPENT LIMES NO LONGER WASTE PRODUCTS.
Under G. R. HISLOP'S PATENTS
All Spent Limes are most effectually, economically, and continuously recovered, and at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it. Descriptive Pamphlet and Terms from Agents as under.
REGENERATIVE SETTINGS OF RETORTS.
Hislop's Patent Producer and Patent Charging Appliances offer advantages which are unapproachable, while in every other detail his Settings are confidently recommended as being the most inexpensive and effective possible.
Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,
Geo. R. HISLOP, Gas Engineer, PAISLEY, N.B.

AUTOMATIC SYSTEM OF CHARGING AND DRAWING
INCLINED GAS-RETORTS.
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By this process there is obtained—
1. **A SAVING OF 70 PER CENT. IN THE CARBONIZING OF COAL.**
2. **AN AVERAGE SAVING OF 2s. 3d. PER TON ON ALL COAL CARBONIZED.**
Which represents a saving of **One Million Sterling** per Annum to Gas Companies in the United Kingdom alone.
This System is being largely adopted at several places on the Continent and in America, and at various Gas-Works in England—notably at the Works of The Gaslight and Coke Company, the South Metropolitan Gas Company, and the Brentford Gas Company.
For Illustrated Description, see Advt. p. 40.
THE PROCESS IS FULLY PATENTED, AND ANY INFRINGER WILL BE STRICTLY PROCEEDED AGAINST.
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Scoops supplied with or without handles, and of any dimensions or shape required.

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Being a Ruled Account Book, with Printed Headings and Analyzing Guide for Keeping, upon the easiest and most correct method, the Expenditure of a Gas Company, in accordance with the provisions of the Gas-Works Clauses Act of 1871, and suitable for all Companies.

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A SPECIAL COMPOUND
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A couple of charges of which will clear a stopped pipe, and an occasional charge keeps them clean, and also increases the make per ton and the illuminating power.

PRICE AND PARTICULARS ON APPLICATION.

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ECONOMY WITH DURABILITY GUARANTEED.
HUNDREDS OF SETTINGS WORKING EMINENTLY SATISFACTORY.

Estimates and Particulars for every Description of Retort Extensions and other Work.

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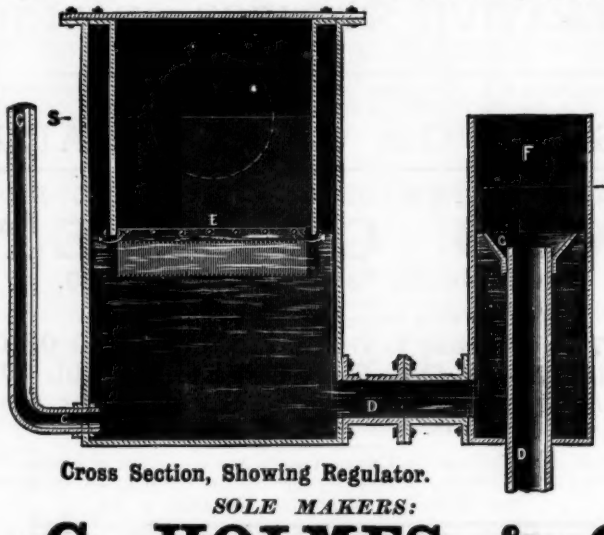
SAVILLE'S PATENT REGULATOR WASHER
(As described in the JOURNAL OF GAS LIGHTING for Sept. 2, 1890.)

The only Washer without moving parts that can be fixed before an Exhauster.

No more Gas spoilt by over-running the Exhauster.

Perfectly Self-acting.

Particulars and prices on application.



Cross Section, Showing Regulator.

The only safe arrangement to work without Dip.

Less wear and tear on the Exhauster.

No moving parts.

Occupies small space.

State maximum make of Gas per diem.

SOLE MAKERS:
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ONLY GOLD MEDAL Food and Cookery Exhibition, 1890.

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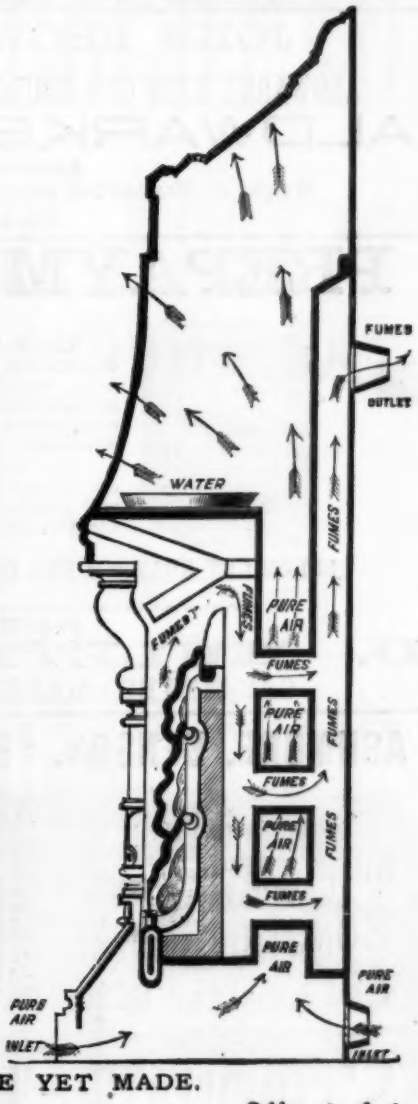

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Best black finished	£2 5 0	£2 15 0	£3 5 0
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Top Panels Electro Nickelled, Brassed, or Copper Bronzed	2 15 0	3 7 0	4 0 0
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With Hand-Painted Tiles, 10s. to 20s. extra.

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NEW HIGH-POWER GAS-LAMP.

Westphal's Patent.

Gas Companies should hire these Lamps to their Consumers, and introduce them for Street Lighting as a rival to the Electric Light, as they do not get out of order, are most economical, and the Burner being a circular slit does not choke up.

Particulars and Prices Free.

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MAKE

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OF ALL FORMS AND SHAPES
IN IRON OR STEEL
BY SPECIAL HYDRAULIC
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ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

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Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

Telegrams: "ATLAS SHEFFIELD."

PREPAYMENT GAS-METER.

(PRICE'S PATENT).

This Meter has a simple Automatic arrangement fitted, whereby, upon the insertion of a shilling, a supply of gas can be obtained, and which is cut off on the quantity paid for being consumed. The Meter gives warning when the quantity is nearly exhausted, so that another shilling may be inserted. There is, however, no occasion to wait until this happens, as a second shilling can be inserted after two-pennyworth of the first shilling has been consumed.

The Meter is fitted with the ordinary registering dial, and has in addition a circular one divided showing twelve pence. On each Meter is marked the number of cubic feet it will pass for one shilling; and this can be arranged to cover cost of Meter-Rental, Fitting, and Gas consumed. These Meters are made of the best material and workmanship.

SPECIALLY ADAPTED FOR INCREASING CONSUMPTION AMONGST SMALL CONSUMERS.
NO RISK OF BAD DEBTS.

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SIMPLE IN CONSTRUCTION
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These Cannels will rank with the Australian Shale for Gas Manufacture.

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Delivery Prices made to any Port in

GREAT BRITAIN,

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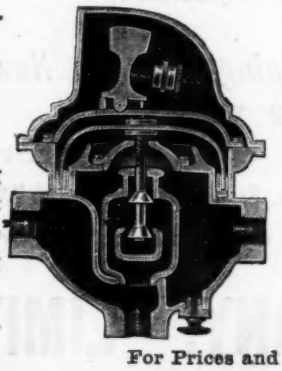
As supplied to and approved of by H.M. Government.

The most reliable Automatic Method of economizing Gas without reducing the Illuminating Power.



HUNDREDS ALREADY FIXED.

FLOOR WARMING STOVE

(LEEDS' PATENT).

CAN BE SUPPLIED FOR EITHER GAS OR OIL.

THESE STOVES ARE

CLEANLY, PORTABLE, ECONOMICAL,

And applicable for all kinds of Rooms where a Comfortable and Wholesome Atmosphere is desired.

For Prices and further Particulars, apply to the Manufacturers,

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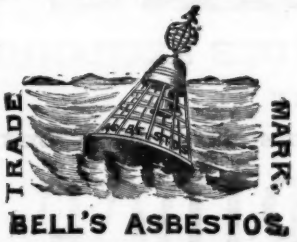
BELL'S ASBESTOS AQUOL PAINT



IS MADE READY FOR USE.

IS FIRE RESISTING.
IS WASHABLE.
IS NON-POISONOUS.
IS MANUFACTURED IN ALL USEFUL COLOURS.
IS IMPERVIOUS TO HEAT, COLD, OR WATER.
IS WITHOUT SMELL.

No expensive Oil or Turpentine required.

WILL NEVER BLISTER.

HAS A COVERING CAPACITY **40** PER CENT. GREATER THAN LEAD PAINTS.

For Outside or Inside Work in any Climate.

Bell's Asbestos Aquol Paint is equally suitable for the finest decorative work as well as for general painting. It can be applied over or under any other paint, and, owing to its easy application, can be used with a large distemper brush; the SAVING THUS EFFECTED IN LABOUR BEING **50** PER CENT. OVER THAT OF LEAD PAINTS.

Bell's Asbestos Aquol Paint is susceptible of the most delicate treatment; and, owing to its perfect flatted surface, it brings up the varnish in a manner that no other paint can equal. ONE COAT OF VARNISH ON **Bell's Asbestos Aquol** IS EQUAL TO TWO COATS ON ORDINARY PAINT.

BELL'S ASBESTOS AQUOL PAINT is specially adapted for Private Houses, Exhibition Buildings, Ships, Churches, Asylums, School Boards, Railway Stations, and all work of Wood, Iron, Cement, Plaster, Stone, Brick, &c., &c.

Those who Study Economy and Protection from Fire should use only

BELL'S ASBESTOS AQUOL PAINT.

BELL'S ASBESTOS AQUOL PRIMING is made Ready for Use.
BELL'S ASBESTOS AQUOL PRIMING stops all suction of Wood, Cement, Plaster, &c.
BELL'S ASBESTOS AQUOL PRIMING should be applied to all New Work.

Suitable for Ceilings, Walls, and New Wood, and is very durable.

BELL'S ASBESTOS AQUOL KNOTTING, for Stopping Knots in New Work.

AN EXCELLENT CURE FOR DAMP WALLS.

Colour Cards and Price Lists on Application.

Supplied in Casks of 5 to 7 cwt., and Iron Drums of 28, 56, and 112 lbs., Sample Tins of 7 and 14 lbs.

Owing to its Covering Capacity, a SAVING IN FREIGHT of 40 per cent. is effected for a given surface.

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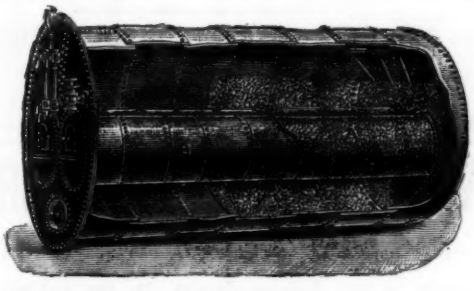
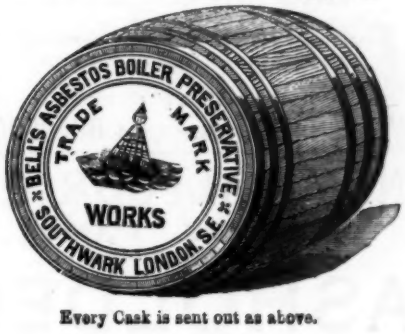
DEPOTS—MANCHESTER: Cable Street, Blackfriars. LIVERPOOL: 2, Strand Street, James Street. HULL: Humber Dock Basin. GLASGOW: 35, Robertson Street. DUBLIN: 2, St. Andrew Street. BERLIN, BARCELONA, and ANTWERP.
AGENTS—BIRMINGHAM: BELL and Co., 7, John Bright Street. BRISTOL: ROBERT STOTESBURY 114, Redcliff Street. CARDIFF: BELL and Co., West Bute Street.

BELL'S ASBESTOS BOILER PRESERVATIVE

Will remove Incrustation from Steam-Boilers of all kinds without chipping.



A shows Boiler Plates when incrusted.
B shows Boiler Plates when cleaned by this Composition.



Every Cask is sent out as above.

The action of this **BOILER PRESERVATIVE,** by absorbing the free oxygen that is in the water, **entirely checks pitting and corrosion.** It also disintegrates incrustation so immediately as to prevent its adhering to the plates; and the deposit falls to the bottom in a loose powder, which is easily swept out. By keeping boilers clean, a **great economy of fuel is effected,** and the danger of the plates burning is entirely obviated; thus avoiding the great risks which are inseparable from scaled plates, lengthening the life of a boiler, and **covering its own cost a hundredfold.** Whenever possible it should be used through Feed Pump or Injector, which it will also keep clear from incrustation. The small quantity required to effect its purpose makes this the most economical, and more than repays the higher price we charge for a fluid which, in the case of many other makers, is useless.

QUANTITY REQUIRED. A quarter of a pint weekly per horse power indicated; where the water is very bad rather more, or one pint for every 700 gallons of water evaporated.

BELL'S ASBESTOS CO., Ld.

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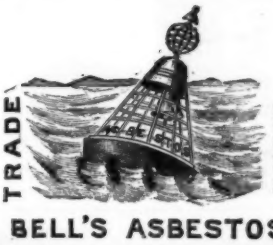
GLASGOW: 35, Robertson Street.
DUBLIN, BERLIN.



DEPÔTS.
BARCELONA, and ANTWERP.
AGENTS.
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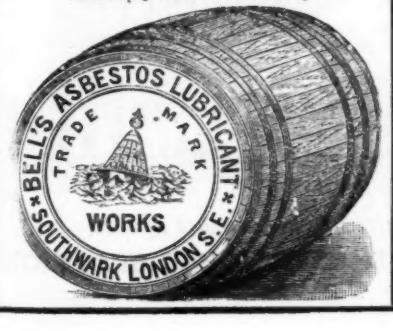
BELL'S ASBESTOS
YARN AND SOAPSTONE PACKING
BEST LOCOMOTIVE PACKING made.

BELL'S
COMPOUND HYDRAULIC PACKING
Is specially suited for
Hydraulic Machinery, Accumulators and Ammonia and all Pumps.

BELL'S ASBESTOS LUBRICANT
Is unequalled
For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.



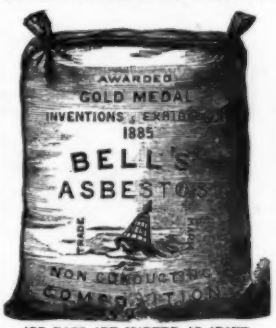
BELL'S ASBESTOLINE
The reputation of this Lubricant is based on the experience of thousands of users, which places it far in advance of those who rely only on mere laboratory tests.

ASBESTOLINE IS THE CHEAPEST MOST EFFICIENT, CLEANEST MOST INODOROUS AND SAFEST LUBRICANT.

ASBESTOLINE HAS SAVED 90 PER CENT. OVER OIL. Has been used for all purposes, AND BEATEN ALL OTHER LUBRICANTS IN ACTUAL WORK.

BELL'S ASBESTOS
EXPANSION SHEETING
RINGS, AND TAPE.
Is the most efficient and reliable Material for Manhole, Mudhole, Steam-Pipe, and all other Joints.

BELL'S ASBESTOS
NON-CONDUCTING COMPOSITION.



Will reduce loss by radiation and saves 40 per cent. of fuel. Is superior to any other, and saves its cost in a few months.

Can be applied again after many years' service. Is sent out dry in bags; therefore cheaper than others sent out wet.

ALL BAGS ARE MARKED AS ABOVE.

BELL'S ASBESTOS
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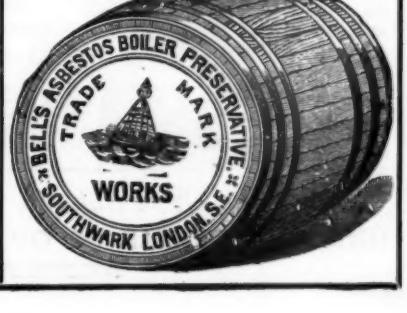
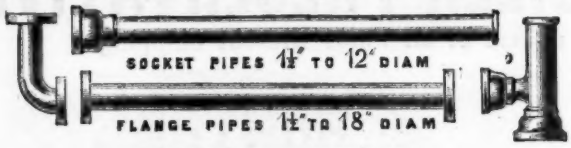
Will effectually keep Boilers clean, and remove any Incrustation, without injury to the Boiler, Plates, or Fittings.



CAST-IRON PIPES.

Castings of all kinds for Engineers, Gas and Water Works, &c.



Irregular Pipes of all kinds.

E. & W. H. HALEY, IRONFOUNDERS, BRADFORD, YORKS.

HENRY BALFOUR & CO.,

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MAKERS OF

GASHOLDERS

And all classes of GAS PLANT,

REVOLVING BRUSH SCRUBBERS, FOUR-WAY VALVES.

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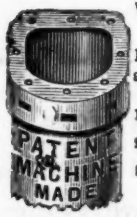
WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,



WORTLEY FIRE-CLAY WORKS,
Near LEEDS

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing Adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

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GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS,

AND ALL KINDS OF GAS AND WATER WORKS PLANT.

WILSON CARTER & PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.

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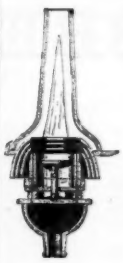
THE NEW "DOUGLASS"

PATENT GAS-BURNERS

(SIR JAS. N. DOUGLASS'S PATENTS).



Burners upon the "Douglass" principle are now on the market for ordinary purposes as used by the Government and at the following Lighthouses: The Eddystone; Dungeness; Whitby; Scilly Rock; and many others.

GIVE A PURE WHITE AND BRILLIANT FLAME.
Without Smoke or Chimney Breakage.

CONSUME LESS GAS, and give a more POWERFUL LIGHT than any other Burner yet devised.

SIZES FROM 15 TO 3000 CANDLE POWER.

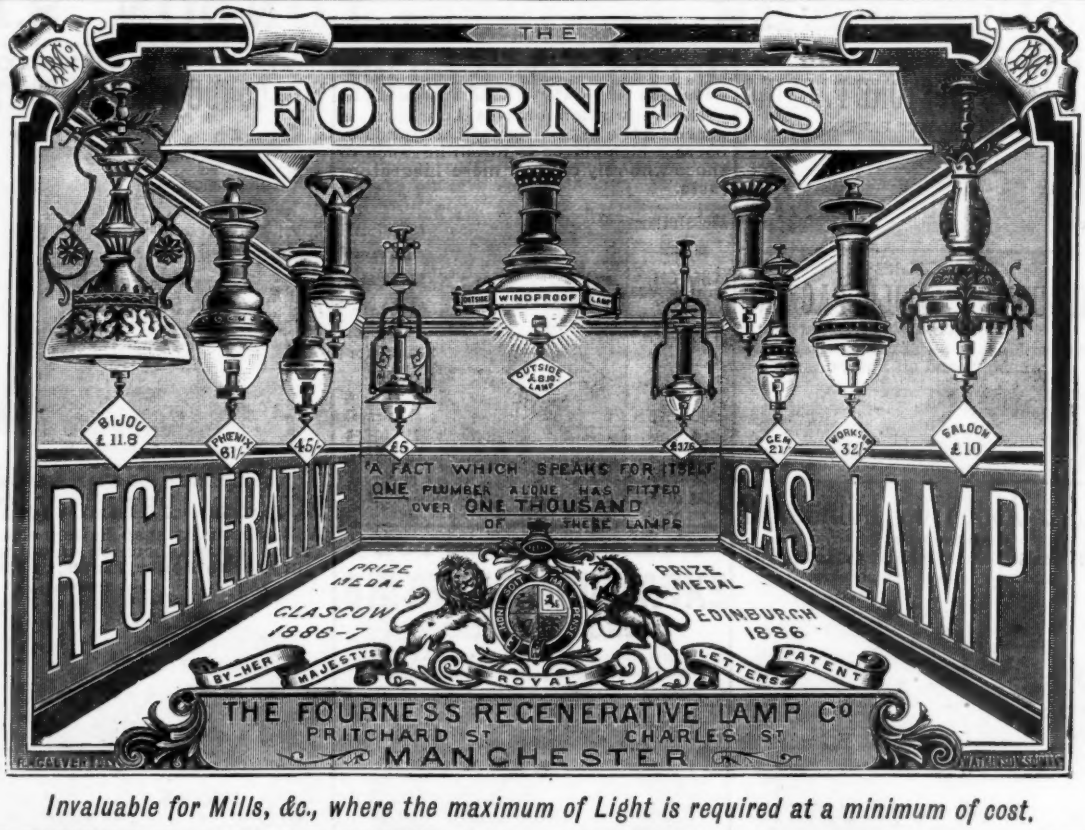
All particulars can be obtained from

F. H. VIGNE,

Agent for the "DOUGLASS" Gas & Oil Burners,

57, Chancery Lane, W.C.

THE CHEAPEST AND BEST LAMP IN THE MARKET.



Suitable for every place where Gaslight is required.

Invaluable for Mills, &c., where the maximum of Light is required at a minimum of cost.

ONE WORKS HAS 96 OF THESE LAMPS FIXED AND GIVING SATISFACTION.

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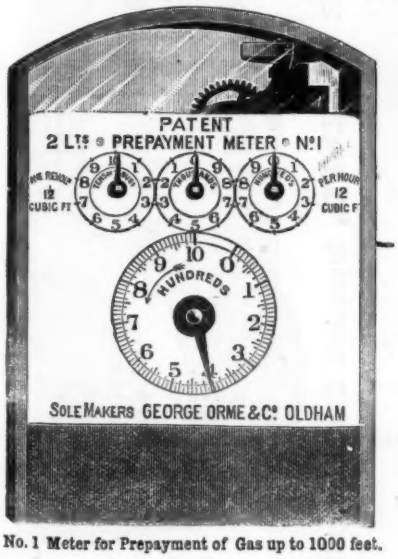

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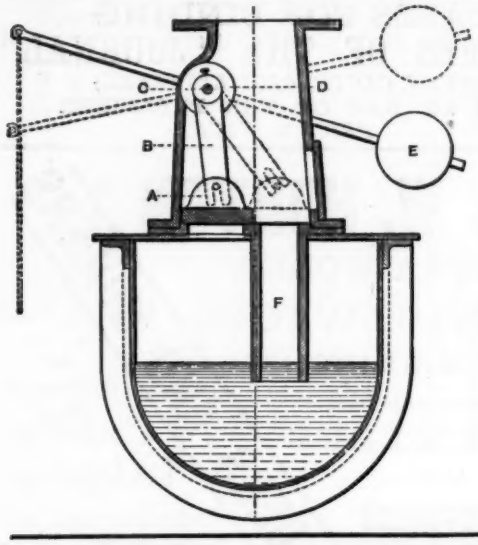

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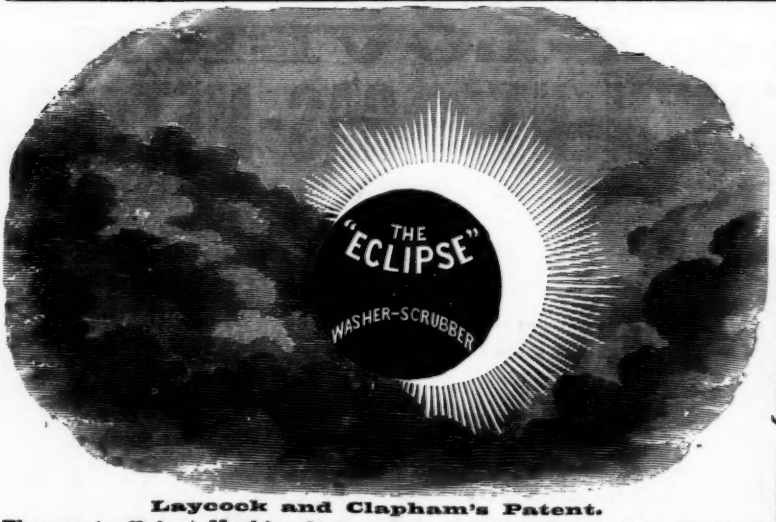

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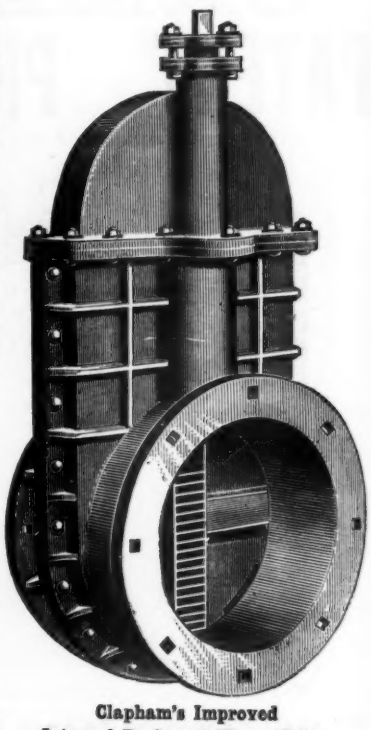

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